The Builder.

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Trevithick.

RICHARD TREVITHICK was a Cornishman, and an able engineer, plain, practical, and great, like Watt, Smeaton, and George Stephenson, — a man of genius.* He had the power and energy of any of them, but not the subtilty of Watt, the accomplishments and scientific knowledge of Smeaton, or the quality of looking after his own interest as well as that of others that George Stephenson had. He was descended from an ancestry of Cornish Trevithicks, the last of whom before him married a lady whose forefathers came to Cornwall from Ireland. Trevithick was born in 1771. The first practical application of steam to pump water out of the Cornish mines was made by Newcomen in 1705, who combined the ideas of Savery and others with his own great mechanical genius, and applied the action of a piston moving in a cylinder to give motion to a beam overhead. Many of his engines were erected in Cornwall to pump water out of the mines. The cylinders of Newcomen's engines were open at the top, and the efficacy of the machine depended on the degree to which the steam underneath the piston could be condensed, after it had done its work of raising the piston to the top of the cylinder, and thus allowing the weight of the atmosphere to drive the piston down again. It was thus called the atmospheric engine. Keeping to the same principle, various improvements were made from time to time, until Trevithick's father, who was the manager of several mines in Cornwall, in or about the year 1778, substituted self-acting gear and valves for those which had previously been worked by personal attention after each stroke of the piston. Besides this improvement of the engine, he improved the form of the boiler, the top of which had been theretofore made flat; but as this form has but little power of resistance, Richard Trevithick, sen., made the top in an arched form, by which he brought directly into play the tensile strength of the material to resist the internal expansive force of the steam.

In 1777 Watt appeared in Cornwall, with his newly-invented method of using steam by condensing it in a separate vessel, whereas Newcomen had been used to condense it in the cylinder itself, and, as Trevithick's father adhered to Newcomen's method, he and Watt contended for the approval of their respective engines by the proprietors of the Cornish mines. He made also a great improvement in the system of mining; that, namely, of excavating the rock upwards instead of downwards, having first sunk the shaft to the lower level. In the old system, the road over which the broken rock had to be conveyed was continually destroyed, and the drainage of the water away from the miners was prevented, whereas in the new system these difficulties were got rid of.

All these and other like things became gradually known to Trevithick. The actions of every man are necessarily governed to some extent by the condition in which he is born, and by the circumstances which happen within his apprehension during his youth. Trevithick was a man of great powers of body and intellect, and had no other, or but little, education than that of the things which transpired around him, and which his idiosyncrasy enabled him to observe and appreciate; those, namely, of mining operations. When he was eighteen years old he worked at the Stray Park mine. When he was twenty-one, he was employed by the shareholders in Tin Croft mine, to examine and report on the relative duties, or the work done with a certain quantity of coal, in the patent engine of Watt, and in that of the double-cylinder engine of Hornblower. "Thus," says the author, "at the early age of twenty-one, Trevithick was in public and professional contact with Watt, and from that period dates the competition of the great low-pressure engineer and his youthful and vigorous high-pressure rival."

In 1796, the year before his father's death, and when he was twenty-five years of age, he competed with Watt and with Bull in saving coal, by the various methods of using the force of steam to raise water, Trevithick's method being to improve Newcomen's beam-engine; Watt's (also with the use of the beam), to condense the steam in a separate vessel; and Bull's, to place the steam cylinder directly over the weight to be lifted, and therefore requiring no beam. It was useless, however, to try to compete with Watt so long as the steam was condensed in the cylinder, and Trevithick in some cases worked his engines at high-pressure, without any condensation, the waste steam being driven out into the atmosphere.

When water, admitted into a pump-barrel, is required to be raised to a greater height than about 30 ft., a solid tight-fitting piston is sometimes used, which, in the downward stroke, forces the water up the rising main; but as sand or other obstructive matter is usually drawn into the barrel with the water, the piston or the barrel soon wears out. Trevithick adopted a plunger, which works in the barrel of the pump without touching its sides, the effect being that it displaces just so much water each stroke as its cubical capacity measures, the only part subjected to wear being the gland at the top of the barrel, through which the plunger works.

It is probably not generally known that a steam road-locomotive ran through Oxford-street, Tottenham-court-road, and the New-road, in London, seventy years ago, at the rate of eight or nine miles an hour; but Trevithick, after constructing an engine of this kind at Camborne, in Cornwall, made another in Leather-lane, and drove it through the streets of London. Both came to grief by running off the road, the one into a ditch, the other into a garden. This tendency of his road-locomotive seems to have turned his attention to confining the wheels to iron tracks, and, in 1804, he constructed a locomotive which ran on a tramroad at Pen-y-darran ironworks, in South Wales, taking ten tons of iron and seventy men over a distance of 9¾ miles. Soon after he sent a similar engine to Newcastle-on-Tyne for use on the railroad of the Wylam colliery. Here was a chance for the North-countrymen to learn something, and they were not long in doing it. Of course everybody went to see it:—"Mr. Wood and George Stephenson, with Mr. Wilson, the engineer, and Timothy Hackworth, then a blacksmith, afterwards engineer on the Stockton and Darlington Railway, and maker of the *Sanspareil* locomotive, that, a quarter of a century later, competed on the Liverpool and Manchester Railway." Robert Hawthorne, also, the author thinks, was probably one of the lookers-on, for "a few years afterwards the two great engineering establishments in Newcastle, known as Hawthorne's and Stephenson's, began to grow into importance."

The blast-pipe is an all-important part of a locomotive engine, and both that sent to Newcastle and that in Wales, as well as one constructed at Coalbrook Dale, had it, although the invention was afterwards claimed by others. These are not unsupported statements. Authentic documents and letters are referred to showing their truth. It is, however, open to doubt whether Trevithick, with all his genius, used the blast-pipe for its main purpose in a locomotive,—that of creating a powerful draught of air through the fire, and so increasing the heat to a degree that could not otherwise be attained; or whether, as Mr. Smiles says, he only turned the waste steam into the chimney to get rid of it.

In 1808 Trevithick laid down a circular railway in a field adjoining the Euston-road, near or at the spot now forming the southern half of Euston-square, and placed upon it a locomotive engine; and Mr. John Isaac Hawkins, a well-known civil engineer, said, in 1847, "On that railway I rode, with my watch in my hand, at the rate of twelve miles an hour."

The author says, and apparently very justly, "To Trevethick and his never-ceasing practical exertions, in Cornwall, London, Shropshire, South Wales, and in Newcastle-on-Tyne, are we indebted for the first practical and real evidences of steam locomotion."

He invented and set to work, on the river, at Blackwall, the first steam dredging-machine. He drove a driftway under the Thames about the same time, *i. e.*, 1808, from the southern shore almost to low-water mark on the northern shore. This was about two miles and a half below London Bridge. It was 5 ft. high in the clear of the timbering, 3 ft. wide at bottom, and 2½ ft. wide at the top, in the clear. He sank a shaft on the southern shore, at Rotherhithe, and drove his heading level for three-quarters of the distance across, being 30 ft. below the bed of the river. He then began to rise towards the north shore, with an inclination of 1 in 9, so as to come out at the surface; but after getting through 1,028 ft., the whole length being about 1,128 ft., he came to a quicksand, which broke into the driftway, and the work was abandoned.

He invented iron tanks for containing water for ships' use, instead of wooden casks, and for water ballast in the hold, and for other purposes on shipboard; a floating dock, made of wrought-iron plates riveted together, for docking a vessel of considerable size while riding at her moorings, by means of which the ship might be supported as in a common dock, and the water pumped out so as to leave the keel dry.

His specification for building ships of iron instead of wood sets forth that the sides and deck are to be of wrought-iron plates; that ships so constructed can be built so as to carry, bulk for bulk of ship, a much larger cargo; that they will be free from vermin, and extremely durable; and that if shot through the side there will be no splinters, as a shot would carry away no more of the ship's side than the diameter of the ball, and the hole could be plugged up at sea. It is stated that in 1812, he, having invented the screw-propeller for ships, offered it to the Navy Board, with a proposal to test its superiority to paddle-wheels.

Davies Giddy (afterwards Gilbert), a Fellow of the Royal Society and a Member of Parliament, was Trevithick's great friend, helping him with scientific explanations of his inventions, and with calculations which he himself,—although not at all an illiterate man,—could not work out, and standing by him with encouragement in all his troubles; but men like Trevithick, after the

* Life of Richard Trevithick, by Francis Trevithick, C.E. Vol. I. E. & F. N. Spon, 1872.

time of their youth, can bear with but little interference. Had he had scientific knowledge to start with, it might have reduced his impetuousness, but would probably have enabled him to carry out his ideas with greater success, and to greater perfection. He appears to have been free from the vice of selfishness, and cared not who or how many benefited by what he did, showing his inventions to all comers; but, as in many other instances where generosity is unallied with either scientific knowledge or cunning, his great exertions brought him no personal wealth.

The difference between Trevithick's schemes and those of many other inventors is, that his were worked out in detail, as though he were describing something that had been done, rather than what was to be. Most of his ideas, so far as they are revealed in this first volume, have since been carried out by or with the help of mathematicians.

SANITARY SCIENCE AND SANITARY POLITICS.

THE important question of urban purity, so long and so often urged in our columns, has at last taken hold of the attention of the public. It may be said, indeed, that circumstances have compelled an unwilling attention. As to that we are not disposed to grumble; the great point being, that the subject, now that it has confessedly assumed dimensions of imperial magnitude, shall not be disposed of by a side wind; but that all those manifold problems which are involved in the one general solution shall be adequately and correctly wrought out.

The facts before us, we have before pointed out, must be regarded not as isolated phenomena, but as a whole. To this whole must be added, year by year, and month by month, the new results of investigation, and the new conclusions of science. On the one hand we have to review the action of the Legislature, as resulting in the Public Health Bill, the details of which we examined at some length on the occasion of its introduction into Parliament. On the other hand we have the debates of the Parliament of Science; in the reports presented to the British Association during the late meeting. We must regard each of these contributions to the law and to the knowledge of the subject, in order to keep up to the level of advancing intelligence.

On one of the questions as to which, in our usual cumbrous and dilatory mode of procedure, we are slowly collecting the data for subsequent legislation, namely, the pollution of rivers, the opinions expressed by the Association were quite unhesitating. Major-general Sir James Alexander read a paper, expressed in very strong terms, as to the injury inflicted on the public, with reference both to the destruction of fish, and to the carriage of the germs of disease by the neglect of the Scottish rivers. He especially called attention to the case of the Forth. Professor Fawcett, the chairman of the section, intimated that it was now too late to raise the general question. The evil of the pollution of rivers was generally admitted. The practical question was, what remedies could be suggested. On this point, however, excepting so far as regarded the general view that "the Government ought to do something," the members of the section were generally mute. Sir John Bowring gave details of great interest as to the fish culture of the Chinese, and as to their culture of edible vegetables in water. Beyond, however, the expression of the opinion that the Government sanitary measure of the present year has only touched the fringe of the question, and that Government should seek the counsel of engineers as well as of chemists, the proceedings of Section F (Economic Science and Statistics), cannot be said to have had much practical bearing on the subject of riparian purity.

The fourth annual report of the Committee on the Treatment and Utilisation of Sewage was received by Section G (Mechanical Science). The division of two essential parts of the same subject between the Statistical and the Mechanical sections is not very happy. Again, the Chemical Section is called upon to discuss the same matters. So important is the subject, and so unfortunate is the result of its being thus frittered away in detail, that we suggest for consideration the formation of a separate sub-section for dealing with the national question of sanitary engineering; including in one view both the mechanical and the chemical divisions of the subject, on the concurrent elucidation of both of which the economical results must depend. We are not yet in a condition to discuss either of these parts of the subject by itself; and in this fact lies the real source of the difficulty of a prompt and decided action with regard to the restoration of the purity of rivers.

Five distinct methods or examples of the treatment of sewage were reported on by the committee. These investigations have been arrested, for want of funds; but yet have produced some results of value.

The first process dealt with by the report is one which is in operation in the workhouse of Stoke-upon-Trent, an establishment containing about 750 inmates, and known by the name of *Weare's process*. It is unnecessary for us to enter into the details of the report. The principle involved is that of filtration through charcoal, which, at the close of the process, is employed as manure. The result of the process is stated by the committee in a few words. The suspended matter is absorbed by the charcoal. The quantity of ammonia, and that of organic nitrogen, is also much reduced by absorption. But no chemical action proper, or at all events no oxidation, occurs; and the effluent water is stated to be to all intents and purposes merely diluted sewage. As far, therefore, as the report of the committee carries weight, we must add Weare's process to the long list of failures; which it would be highly instructive to tabulate in a compendious form.

The second section of the report dealt with the process in use at Ealing; namely, upward filtration, and the method of General Scott. The committee declare upward filtration to be absolutely worthless. This is not the first time that this opinion has been formed. We are not in possession of facts to invalidate the judgment of the committee. At the same time we cannot but think that it must be held to apply to detail, rather than to principle. That, so far as matters suspended in a fluid are concerned, they can be more readily removed by calling in the aid of gravitation, opposing an obstacle to their ascent, than by merely mechanically straining them out from a descending column of water, seems, *primâ facie*, apparent. Against this has to be set the greater facility afforded for cleansing the downward acting filters, by intermittent use and disuse. But we must confess some surprise, and some disappointment, that no method has yet been hit upon for enlisting the force of gravitation in the service of purification. We should like to see an upward filtration attempted through a porous artificial substance, which should be subjected, on alternate days, to the *washing* power of a head of water, in the reverse, or downward direction, for half an hour or an hour. The principle of upward filtration cannot be held to be disposed of without some such experiment as this. It is true that chemical precipitation is one of the great engines which we have to employ, but mechanical filtration may reduce the cost of the chemical agency.

Ealing has a population of 10,000, and the daily flow of sewage averages from 350,000 to 400,000 gallons. The precipitants used by General Scott are lime and clay. These are mixed together, and introduced into the main sewer, at the distance of about a mile from the works. This admixture is said to reduce the clinging, quasi-glutinous, character of the sewage, so that the sewer through which it runs does not become coated with deposit. The fluid is then made to ascend through a filter of sand and gravel. The precipitate thus arrested, or strained out, is removed and placed on a floor of hot plates or tiles, below which a fire is kindled. It is, in fact, a sort of drying-floor, in which the solid matters mechanically suspended in the water, and removed by filtration, are treated much like bricks in a brick-kiln. The sewage bricks, however, contain nearly 30 per cent. of organic matter, which is combustible. After the first drying they are burned in a kiln, the organised matter supplying so much combustible material that very little other fuel is required. The product of this combustion is crushed in a mill, and is said to form a good cement, selling at 30s. per ton. This is further said to yield a profit of 10s. per ton, or 50 per cent.; but the committee have not reported on the question of cost. The effluent matter is shown by analysis to contain rather more than two-thirds of the chlorine and of the dissolved nitrogen of the sewage, although the nitrogen appears to have undergone a change in its combination. The ammonia is reduced to one-quarter of its original amount; but the organic nitrogen is nearly doubled. Results so anomalous show that we are as yet far from a thorough comprehension of the chemistry of the case. The process, if successful, will have a commercial value of much importance to the inventor. We have therefore little doubt that the practical ability of General Scott will not be diverted from the investigation, until we derive, at all events, a considerable increase in our knowledge of the chemistry of the question. We must never forget that it is within the province of chemistry that the real knot of the matter lies. Even in the best cases of disinfecting sewage by passage through the earth, the process is chemical, though conducted in the laboratory of nature. Why and how earth, under certain conditions, *does* disinfect, we have yet to learn. This is the great question which the curators of human health have now to put to the chemist. On the reply to that question will hinge the sewage arrangements of the future. At present it can only be said that, under certain circumstances, *one* of the great difficulties incurred in the treatment of sewage is alleviated by this process of combustion.

The third, fourth, and fifth sections of the report deal with experiments and observations on the utilisation of sewage, and purification of the effluent water, by irrigation and earth-filtering.

Under the pressure of injunctions from the Court of Chancery, the local board of Merthyr Tydfil have converted 20 acres of land into a filter, on a plan suggested by the Rivers Pollution Commission. The soil consists in a deep bed of gravel (probably the former bed of the river Taff), composed of rounded pebbles of the old red sandstone and coal-measure formations, with loam and sand interposed, forming a highly-porous subsoil, with a vegetable mould upon the surface. The land has been pipe-drained at a depth of 7 ft.; the pipes converging into an open drain, which conveys the water into the Taff. The sewage is first passed through a bed of slag, which arrests the coarse matters. How this filter is dealt with when it requires cleansing is not stated. The area is divided into four portions, on each of which the sewage is turned, in rotation, for six hours at a time, being led on by surface carriers and drains. The surface of the land is cultivated to a depth of from 16 in. to 18 in. The average daily supply of sewage is about 900,000 gallons; but, owing to percolation from the river, the quantity of effluent water nearly doubles the amount. This water has been analysed at different sewers. It is stated that the suspended matters are removed, and that the ammonia and nitrogenous organic matters held in solution are almost entirely oxydised, so that they appear in the effluent water in the form of nitrates and nitrites. The Commission therefore report that the sewage is purified, but cannot be said to be utilised. It will be evident that here again are to be found elements of importance for the ultimate chemical analysis of the entire question. The oxydising of the nitrogenous matter by the gravel filter, as compared with the absence of this important process in other cases, is a matter of great importance for us plainly to understand.

In the farm at Romford the committee found by analysis that one-tenth only of the total nitrogen applied to the land was to be detected in the effluent water, and that not in an organic form. 40 per cent. was accounted for by the crops; and the remaining half of the original quantity was as yet unaccounted for. Analysis of the soil is expected to reveal its presence, but experiment on this point is reserved for next year.

In the Chemical Section, on the 20th August, Professor Corfield described the new process known as Whitthread's Patent, in which one equivalent of monocalcic phosphate (the commercial superphosphate) and two equivalents of dicalcic phosphate, are added to the sewage, followed by a little milk of lime. The precipitation is rapid and complete. The suspended matters are removed, and the organic nitrogen is almost entirely removed. The ammonia is increased in amount, and phosphoric acid remains in solution in the effluent water. The precipitate contains phosphate of lime, which is a valuable manure. It also contains 3 per cent. of ammonia, which considerably enhances its value. But the loss of the phosphoric acid in the effluent water is a drawback. The process is one which eminently demands further careful investigation.

The outcome of the debates of the different sections appears to be this. We are in a state of

doubt as to the true chemical solution of the question of utilisation. Fresh information is being daily attained, and the ultimate result, we trust, is not very distant. First in efficacy is the powerful chemical agency of the earth itself, especially when aided by the organic chemistry of the plant. But the application direct of sewage to land is difficult, and not everywhere practicable. Then we have processes of mechanical filtration; and among these the discovery, by General Scott, of the combustible character of the organic matter is likely to play an important part. Thirdly, we have the method of chemical precipitation. Of the various methods suggested, that of Whitthread comes to the fore as most worthy of investigation, in the present state of our information. The question of precipitation and oxidation of the nitrogen by recomposition underlies the commercial value of the proposed methods of utilising our refuse.

It is now desirable to examine how far the Act of Parliament, 35 & 36 Vict., c. 79, entitled An Act to Amend the Law relating to Public Health, corresponds with the Bill brought into the House of Commons by Mr. Stansfeld, Mr. Secretary Bruce, and Mr. Hibbert, of which we gave an abstract in our numbers for the 23rd of March and 6th of April last.

With the exception of clause No. 3, postponing the operation of the Act for three months from the date of the Royal Assent, which is now omitted, the first eighty-one clauses of the Act are very nearly identical with those of the Bill. Certain obligations under which the former proposed to lay the local Government Board, as to obtaining a preliminary report of inspectors, are omitted, and the appointments of medical officers of health and inspectors of nuisances, first made after the passing of the Act, are limited to a period not exceeding five years. With regard to future organisation this provision may prove highly important.

The important clauses with reference to the prevention of nuisances are all omitted from the Act of Parliament. The prohibitions as to putting solid matter into streams; as to turning sewage into drains; the powers given to the sanitary authorities in this respect; the penalties as to smoke nuisance, as to neglect to cleanse, as to obstructing sewers, as to adulterating food; the clauses as to closing foul pumps and wells, and buildings unfit for human habitation; the regulations as to purity of water supply, as to gas supply, as to hospitals; as to analysts; as to false representations in case of infectious diseases; and the power to buy up water-mills; all have disappeared. Thus the Act may be broadly said to effect only one object,—the division, or rather the authorisation of the division, of England into sanitary districts, urban and rural, under local authorities, which are to appoint medical officers of health and other officers; and the further giving to the inspectors of the local Government Board similar powers, with reference to those local Boards, to those which the Poor-law inspectors have under the Acts relating to the Poor-law. A single clause, empowering sanitary authorities to destroy infected bedding, and another, inflicting a penalty not exceeding 50*l.*, for wilful obstruction of the rules of the local Government Board, are all that we find of positive sanitary enactment.

There is no doubt that deep and serious disappointment has been felt by the advocates of sanitary reform at the mutilated form in which a Bill that they considered to err, as it was, on the side of defect, has been passed through Parliament. Professor Fawcett called the measure a most imperfect one, and warned his hearers at the British Association not to be misled by any members of Parliament who would now be "running up and down the country singing the praises of the work done by Parliament." At the same time, we must remember, first, that no notion is entertained that this Act is to be final. Secondly, a project to consolidate the whole of the laws relating to the public health is one of such magnitude that it ought to be the principal, or one of the principal, objects of a session. During the last few months, the time of the House of Commons was so occupied by the long and repeated discussions of a political measure that may possibly affect the distribution of seats, and that in a very unexpected manner, that we could not expect the House of Commons to give a due amount of attention to matters that only affect the public health. If pestilence comes on us unprepared, no doubt it will be deplorable. But still, what is that to the question of maintaining a majority? Dreamers, like ourselves, may hold that we should study national wants first, and political theories afterwards. But these are poor common-sense views, and by no means attain the dignity of Parliamentary importance. Let us be thankful, then, for what we have got, and only trust that some new enigma may not be started as a Parliamentary hare for the session of 1873.

But beyond this great question of the consolidation of the laws, the very magnitude and importance of which forbid any but the most maturely considered legislation, it is evident, from what we have previously stated, that we are not as yet fully ripe for one of the main enactments which the future welfare of the country will require. That our great rivers are foully polluted, and that a stop must be put to this outrage on common sense and public decency, we do not need a Royal Commission to inform us. So far as that, public opinion may be said to have been already formed. But we object to being made ridiculous by contradictory legislation. We object to have injunctions issued by the Lord Chancellor, obedience to which is rendered impossible by the House of Commons. No sanitary authority, no municipal body, no private individual, ought to be placed in so false a position as that now occupied, not of its own fault, by the town of Birmingham. In a word, while as anxious as any one can be to prevent, first, the pollution of streams, and, secondly, the loss of crop-feeding material, we cannot admit the propriety of stopping up the end of a sewer without providing a proper mode of dealing with its contents. With certain matters, such as the offensive refuse of manufactories, we think that the law should at once, if necessary, be enlarged so as to deal. We doubt much whether it is not, at this moment, only awaiting appeal to its efficacy. But with the general and immediate arrest of the actual course of all our sewage we are not in a position summarily to deal. We may do much—we may prepare for doing all. But we must have the chemistry of the matter made clear before we can impose immediate penalties. We are hard upon the traces of discovery. We can, by one process, purify effluent water. We can, by another, utilise sewage to a certain extent. In a third instance we see rich crops rise out of what was once barren land. But we cannot afford to leave every local board to its own devices. We must throw all the light that science can shed on this vital question. We must avoid the theorist, the speculator, and the airer of hobbies, no less carefully than we avoid the old stager who is for leaving everything alone. The great power now placed at the disposal of the head of the Local Goverment Board must be guided by adequate science. Full illumination, such as there is now for the first time an opportunity of summarily obtaining must be shed on the point. The time for Commissions of Inquiry must be considered past and gone. Such a patient, exhaustive, able, investigation of the great requirements of the country in the matter of sanitary engineering, as Prussia inaugurated in the matter of military organisation, must be taken in hand. Of such an organised attack on ignorance and on filth we cannot doubt the triumph. The one thing necessary is, that the difficulties be confronted as a whole, and dealt with as a serious matter of business. The natural configuration of the country must be one main element in the consideration. The treatment of the sewage of Norwich, and that of Oldham, or of Keswick, are problems in which nearly every element varies. They are very different cases of a rule, but cases which must yet come under one general rule. The country demands adequate legislation. But, still more imperatively does it demand that clear intelligence of the case by which alone legislation can become otherwise than mischievous. We look, with an anxiety that is shared by nearly all conversant with the subject, for indications of the action of the Government in two particulars. First, how will they give a guiding impulse to the local organisation of sanitary authorities provided for by the recent Act? Secondly, how are they confronting the great question of the general sanitary engineering of the country?—the preservation of its streams?—the restoration of its fisheries?—the water-supply of its population?—and the application, in each physically-defined district, of the best outcome of the present condition of chemical and mechanical science?

The Autumn Military Manœuvres.—A map of the district has been published by Mr. Wyld, of Charing-cross,—very useful just now.

THE NORTHAMPTONSHIRE EXCURSION.

STARTING early from Wellinborough on the fifth day of our wanderings (the 23rd ult.),* we made a delightful beginning of the day with Finedon Church, "the Heckington of Northamptonshire," well known by reputation as one of the noblest churches of Late Decorated style in the country. The tower, with its rich deeply-cut bands of trefoil and quatrefoil decoration, and the beautiful tints of the grey stone and lichens, diversified by bands of red stone, is as pleasant an object as the eye could desire to rest upon in the sunshine of a bright morning. The wide spacing of the arcade, the fine mouldings of the capitals and piers, and the deeply-recessed windows with their escoinson arches, combine to give an aspect at once of solidity and spaciousness to the interior. The window tracery is nearly all of that reticulated form common in the period to which the church belongs, but entirely destitute of foliation; a peculiarity, but not one to be imitated or admired. The most remarkable thing in the church, in one sense, is certainly the stone straining arch, if we may call it so, built across the nave between the piers immediately west of the transept bay. The north and south aisles terminate eastward with arches carrying a solid wall above, dividing them from the transepts; but no such arch spans the centre aisle; the natural consequence of course would be the thrusting inward of the nave-piers at this point by the side arches abutting against them. That the original builders of the church should have overlooked so obvious a want of balance in the construction is as discreditable to them as the clever and picturesque manner in which they remedied the mistake is creditable. This is effected by throwing a segmental pointed arch across the nave between the two piers affected, met by an inverted segmental round arch from the wall above each pier; a kind of flying buttress being thus formed across the church, the spandrels filled in with tracery. The mouldings show this feature to be somewhat later than the main building, so that the necessity for such a constructive addition was not at once discovered. The architect who contrived it evidently obtained credit for his work, and was called on to repeat the same thing at Rushden, some five or six miles off. The church has been carefully and conservatively restored by Messrs. Slater & Carpenter. In the west gallery a Renaissance organ-case, of remarkable beauty and elaboration, suggests something out of the common way; and the following little bit of history in relation to this instrument, supplied in the report of Mr. Holdich, who recently repaired it (dated May 10th, of this year), will be of sufficient interest to many of our readers to excuse its insertion:—

"*Finedon Organ.*—This most interesting instrument was built by Christopher Schneider, son-in-law of the celebrated Father Schmidt. It was opened in the church 17th of May, 1717, by Dr. Croft. J. Kent, who wrote many beautiful anthems, was the first organist. Nothing had been done in the shape of modernising, excepting that the 'echo organ' was inclosed in a box with a sliding front, to make an attempt at a swell. This was done, I believe, by the Rev. W. Jones, of Nayland, who wrote the beautiful tune 'St. Stephen's,' or 'Nayland,' so called. He was curate at Finedon.

In 1853 I was bold enough to add two octaves of Bourdon pedal-pipes and German pedals. In this state it has remained until the present time, when, from age and decay, the machinery would work no longer. I have now entirely rebuilt it, but used all the pipes I could, and retained the handsome case and curiously-dispered pipes. I should doubt whether there is another organ in the kingdom that can show such an original exterior."

It would be wrong to leave Finedon without a word as to the effect exercised on the picturesque character of the neighbourhood by the good taste and liberal expenditure of Mr. Dolben, whose grounds, with their beautiful lime-tree avenue ("the cathedral of Finedon"), adjoin the churchyard. Some of the cottages and lodges erected by him in the district do equal credit to the owner's intentions and to the way in which they have been carried out by his architect, Mr. Law.

Our next church, Dithlingborough, should be better known than it is, for its fine and almost unique tower, with solid square substructure and octagon upper story; quite unique in the manner in which it has been shored up by masses of masonry on the east side, to provide probably against the result of some failure of the foundations, that great bugbear of the Middle Age builders. Architecturally excrescences, these buttresses yet add materially to the wildly picturesque expression of this singular tower,

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* See p. 680, *ante*.

standing quite apart to the westward of the church, which latter in itself is nothing remarkable. Higham Ferrers, with its grand Early Decorated tower and spire, is too well known through illustration to call for much comment here; except a word as to the effect which the small flying buttresses at the base of the spire have exercised on the angle pinnacles, which are visibly pushed out of perpendicular. It is as well that young students of Gothic should recognise that Mediæval architects really did make mistakes sometimes; and that features essentially constructive, when used where construction does not call for them, will sometimes revenge themselves on the architect for his mistake. The interior, with its fine double nave, has been restored and reseated recently; the natural polychromy before referred to, obtained by bands of limestone and ironstone, has been largely used in this interior, but irregularly. The brasses in the chancel are of unusual size and elaboration, and in excellent preservation. It was in this church that, at one period, a perpetual service was kept up, day and night, by the zeal and devotion of the Ferrers family. Allusion to this is made, if we mistake not, both by George Herbert and De Quincey, in their respective fashions. Rushden, hardly a mile from Higham, is very similar in the general character of its tower and spire, though far less rich. The ironstone is largely used here in bands, and as quoins to the buttresses, in contrast with limestone. The effect of colour here is remarkable, for while the ironstone has retained its strong deep red on the west side, the returns to south and north, the former especially, are coated with a greyish vegetation, while the limestone has been weathered to a greenish tint. The effect is very rich and unusual, and would furnish good employment for the artist's brush. The font in the church should be noticed for some singularly bold and broadly-treated leafage ornament of the Transitional period, almost "classical" in its symmetrical arrangement. Our next church, Irchester, is also noticeable chiefly, if not entirely, for its tower and spire of Decorated date, singularly happy in proportion; and here we find the most deliberate and regular use of polychromy we have yet chanced upon, in the masonry of the tower, composed entirely of bands of red and grey stone of equal width. As harmonised by weather, the effect is very good, but must have been very "streaky" when new. The spire broaches are remarkably low and squat in proportion; but the effect (the whole being on a small scale) is by no means bad. The Saxon tower at Earl's Barton, which we next inspect, is well known: occupying such an exposed site as it does, on high ground, one is surprised to find it, at this date, still in such fair preservation. The church is small, and not of special interest. A drive of seven miles brings us to Northampton, to find comfortable quarters and super-excellent fare at the "George," another of the houses which bring their traditions from the "good old" coaching days.

Every visitor to Northampton who knows what he is about will go, in the first place, to St. Peter's Church: it was matter of course, therefore, that we all went there first. This really is a Norman basilica in all but the apse. The eastern end is square, nor is any trace of an apse known to have existed. Apart from this, however, the long, low proportions of the church, the varied and highly-enriched capitals, some of them quite unique, others with a strange touch of Byzantine character about them, convey an impression curiously at variance with our ordinary associations in regard to English architecture. Externally, the long range of small round-arched windows forming the clearstory furnish another characteristic feature. There should be some history connected with the tower arch at the west end of the nave; from the adjustment, or want of adjustment, of the arch-moulds to the caps of the jamb-shafts, it would certainly appear as if the arch had not been always in its present position, or had been rebuilt. The next point of interest (forming the first rendezvous on our Saturday morning's round), is the Templar church of St. Sepulchre, grand in its internal perspective of octagon arcade and heavy pointed arches. The eastern portion, by Sir G. Scott, is a modification of the more florid Early English manner, with, perhaps, rather too much use of the band-work of red and grey stone suggested by the old churches of the district. A passing glance at St. John's Hospital, where there are some good bits of late Decorated work, affords opportunity for some remarks from Mr. Sharpe relative to the employment of stained glass in light diapered patterns, with plenty of white, rather than in masses of strong colour. The east window of the chapel, however, is rather *too* fragmentary, in its re-arrangement of old bits of glass, to stand as the basis of a theory, however intrinsically correct. Then we drive out some five or six miles to eastward of the town, to Cogenhoe, noticing in our way through the suburbs a very good class of suburban houses, not without architectural merit, though, in the main, with considerable sameness of manner. As to Cogenhoe Church, there is not very much in it, excepting a very nice bit of Early English work on the south side of the chancel, where lancet windows are coupled under escoinson arches, the shafts of which are carried down to the floor, past the sill of the actual window. Externally the best thing here is the beautiful wooded landscape seen from the platform on rising ground, which is occupied by the church and parsonage; and the old-fashioned looking parsonage-house, with its trim, well-kept garden. Whiston Church, a mile or two farther on, also most pleasantly situated in a high churchyard amid a circle of tall, dark trees, has a more architectural interest. The tower is one of those fine specimens (of which All Saints', Aldwincle, is another example) built at the early part of the Perpendicular Period, when something of the feeling of the previous style still survived in the details, and before richness of elaboration had degenerated into weakness and wiriness. And here there is the most picturesque and artistic use of the stone polychromy of the district which we have had occasion to notice. Instead of the red and grey stone (here a most delicate grey) being arranged in continual bands of mechanical regularity, we find them here in bands in the lower stage (giving somewhat the same effect as rustication); then an unbroken mass of grey for the next stage; then a broad band, 6 ft. or 8 ft. deep, of the red iron stone, below the belfry stage; then the banded arrangement recurring on the belfry stage, and a band of red, two or three courses deep above it; after which the tower is finished in the grey stone. The effect of this is most pleasing, and the angle pinnacles of the tower, with crocketed heads and gablets, are treated with a peculiar breadth and richness which we have rarely seen equalled; and the whole appearance of this upper portion of Whiston town, the lighted portions shining with almost a white lustre under the bright sun, and contrasted with the dark foliage adjoining, formed a bit of effect to be remembered for long after. Internally the church is an admirable specimen of the period, with very narrow piers, and a wide arcade, with traceried spandrels, and a low timber roof (which has probably been more or less renewed), most elaborately carved on the sides and soffits of the principals, and along the cornice. The arrangement of seats in this church affords a good hint for cases where a church has been provided, from any cause, too large for its congregation. Instead of crowding the whole area with seats half of which are not wanted, the seats have been arranged in small square blocks between the piers in each bay, leaving a wide aisle in the centre and an unusual amount of unobstructed floor space. The effect is exceedingly pleasing, and gives a spacious look to the church which it would not otherwise possess. A short and very pleasant drive brings us to Castle Ashby, the church of which is known as possessing a Norman doorway of excellent character and in good preservation; in other respects there is little or nothing of ancient interest left in the church, the interior of which is almost entirely modern work, by Mr. Street,—but not, we should conclude, very recent. A monument by Tenerari (Rome) to the memory of the second Marquis of Northampton, which stands at the west end of the church, is known beyond the locality: it consists of a sitting figure, more than life size, of the angel of the Resurrection, waiting with upturned face for the signal to sound the trumpet which he holds. This has been immensely praised, and there is a great deal of beauty in the reverential countenance of the angel, but a certain want of power even here; and we submit that the introduction of the trumpet, a sculptured trumpet of ordinary aspect, is a dire mistake, at once giving a littleness, a trumpery (no pun intended) character, quite inconsistent with the grandeur of the idea intended to be conveyed. "The last trumpet" is, partly through association, an expression highly suggestive when vaguely used as poetic imagery; but to translate it into realism in sculpture is as inconsistent with the feeling of the subject as is Handel's "Trumpet Solo" before the air in the "Messiah." A bas-relief monument by the same sculptor, in the north chancel aisle, is a very elegant composition, reminding one a little of Flaxman in feeling, and a monument to the Hon. Mrs. Leveson-Gower, in the wall of the north aisle, deserves notice. The portrait sculpture of the lady represents her in the last sleep on a flower-strewn couch, in a deep niche in the wall. At the back of this is a very low bas-relief of an angel, apparently flying past, and in the act of throwing a pall over the prostrate figure. There is a tenderness of feeling and refinement of execution in this figure such as have not always been associated with the works of Marochetti, by whom the figures were executed. The architectural details are by Mr. Gillott, a former pupil, we believe, of Sir G. Scott, but they are rather wanting in refinement. It was a pleasure, under such a bright sun as we had, to look at the Italian mansion adjoining, sparkling with its white stone and niches and statues, and well-known balustrade over the cornice, consisting of a Latin inscription (the big letters forming the balusters), and at the terraced garden below with similar balustrades, and gorgeous groups of flowers laid out in the kaleidoscope patterns, which the modern gardener produces for the enjoyment of those

> "Who in trim gardens take their pleasure."

And so we drive away down the long avenue, and back to Northampton to our final dinner, and to leave-taking speeches, and congratulations on the glorious weather we had enjoyed all the week; and the health of our accomplished and amiable conductor; and of our reverend friend who had accompanied us on every expedition hitherto; and of our Irish professional brethren, four of whom had crossed the Channel to join us (more power to them!); and of the veteran architect of Northampton (whose name we have had occasion to mention more than once), and who gave some opportune advice to the students to sketch detail carefully, and not to be one-sided, but study Classic equally with Gothic. Our attention to Northampton itself, exclusively of the old churches, was necessarily somewhat meagre; but the town-hall received due attention from a good many of the party. All Saints' Church, a great Renaissance church, Greek cross on plan (weakly attributed by the townsfolk to Wren), is a fine specimen of a really congregational plan, and might be a very fine interior if all the detail were very different from what it is. The grand organ here, with its four key-boards and magnificent body of tone, is one of the finest and largest church organs in the kingdom.

In concluding our notes of a very pleasant architectural tour, it ought to be explicitly said that, on the part of a good many of the party at least, this was no mere tour of inspection. Though much was necessarily hurried into a short space of time, a great deal of material was collected which may be more or less available for illustration of buildings or details not already published. Several of the younger members of the Association in particular arranged to obtain the measured details of the principal (nave) arcade in each church visited; and in this manner the materials were collected for accurately drawing out specimens of the arcades, including of course sections of mouldings, &c., of no less than thirty-nine churches. This must be admitted to be a good week's work, and highly creditable to the character for industry and application of the members of the Architectural Association.

NOMENCLATURE OF GOTHIC ARCHITECTURE.

AFTER dinner on the first day of the Northamptonshire Excursion, Mr. Edmund Sharpe made an address to those present. We have already referred to it in our general notice of the proceedings (p. 660, *ante*), but may usefully print a portion of it *verbatim*:—

It is obvious, said Mr. Sharpe, that along with finer perceptions as to characteristic treatment of different phases of Mediæval art,—differences of detail, which require only to be pointed out to be at once recognised and appreciated, and the knowledge and detection of which increases immensely the interest we take in its study,—it is clear that along with advanced knowledge of the true history of this admirable progress comes also the necessity for a minuter classifica-

tion of its different periods, and of fitting terms by which to distinguish them. And here, in fact, we touch on the greater difficulty that the architectural student has to contend with. Not only are the terms which we have employed for the description of our buildings, so long as we classed them by centuries, inadequate for our present purpose now that we have learned to divide them almost by decades; but there is at this moment the greatest want of unanimity, on the part of those who write and speak on this subject, in the terms that they employ; nor do they indeed always employ the same term when speaking of the same thing. I will give you two remarkable instances of this want of definiteness on two recent and prominent occasions.

On the recent visit of the members of the Architectural Conference to Westminster Abbey, Sir Gilbert Scott was good enough to give them a description of the building, and in the course of his description he made use of the following terms as applied to different portions of the works of the Abbey. After having noticed the *Anglo-Saxon* and *Norman* remains, he spoke of those belonging to the great *Transition from Norman to Early English*, or rather, he added, from *Romanesque to Early Pointed*. He next spoke of the *transition from Early Pointed to Middle Pointed*; but corrected himself further on by calling the latter the "*pure Late Decorated style*." He speaks also of "*Henry III.'s style*, and of the "*transition from the Middle Pointed to the Perpendicular*;" and lastly of the "*Tudor style*," and of that development of it which he recognises as the "*Fan-groining*" style.

Now, if the "imaginary individual" to whom Sir Gilbert Scott professed to address himself on this occasion, and whom he supposed to be somewhat ignorant of the subject, were really present during the delivery of this address, — what remote notion could he possibly form of the nature of the architecture of Westminster Abbey from the terms in which it was thus described? And would not the ten or twelve terms which the learned Professor employed for this purpose be likely to confound and deter him from further approaching a study, the very threshold of which is encumbered with technical difficulties of so formidable a kind?

On the other hand, we have the president of the Northern Architectural Societies urging that the styles of Gothic architecture should be named "from the centuries, or, better still, from the king's reigns, because they possess many characteristics not covered by the old definitions."

Now, what the death of one king, or the coronation of another, can possibly have to do with the progress of architecture, it is difficult to conceive, nor yet why it should be perceptibly changed at the close of each century. Nevertheless, we find Mr. J. H. Parker realising this idea at the recent meeting of the Archæological Institute at Southampton, by describing the Gothic remains of the neighbourhood as twelfth, thirteenth, fourteenth, or fifteenth century work, varying his descriptions by designating some of it as Edwardian, and as work of the Periods of Henry II., Henry III., Henry VII., &c.

Were this system to be adopted, we shonld have no less than fifteen periods, corresponding with so many kings, between the eleventh and sixteenth centuries.

The indefiniteness of the first of these terms, —twelfth-century work,—is obvious when we remember that that period covered the whole of the Norman work of Peterborough Cathedral, which was commenced 1117; the whole of the numerous and remarkable works of the Transitional Period; and the choir and eastern transepts of Lincoln Cathedral, its lancet windows and cloistered columns. What possible idea could this term then convey to Mr. Parker's hearers at Southampton? To me it seems infinitely more practical and sensible to accept the six great classes into which our national architecture, from the Conquest to the Reformation, naturally divides itself, and which every one in his descriptions has now more or less begun to recognise and to fix, by common and unanimous consent, on the terms by which we shall distinguish them.

This we have, I think, a right to demand. As regards the selection of these terms, I am, for my own part, quite indifferent. I have, as you know, proposed terms to apply to these six periods, but I have also, as you know, more than once offered to throw them over if better ones can be found, or others to which more universal assent can be obtained. Till these be offered, I shall retain my own as answering the purpose sufficiently well. It is certainly preferable if possible to retain old terms than to adopt new ones; but there are objections to two of the terms already in use, as applied to the new division, which have always appeared to me insuperable.

It was in the middle of the twelfth century that the influence which Norman art had exercised for ninety years over architectural design in this country began to decline. The next half-century was signalised by that remarkable contest between two rival systems, the circular and the pointed, which ended, at the close of the twelfth century, in the supremacy of the pointed arch in all parts of the building. During the forty-five years of this great Transitional Period, more churches were erected in England than at any subsequent period within the same lapse of time; they show great fertility of invention, great vigour and nobility of design, and, in certain parts, great richness of ornamentation. That they were built by native artists there cannot be a doubt, for in the treatment of their details they are, with a single exception (the choir of Canterbury Cathedral), totally unlike the contemporaneous work of other countries, especially that of Normandy.

I claim, then, for the architecture of this period, the importance and originality of which is not even yet sufficiently recognised, the credit,—first, of its being the earliest English architecture, subsequent to that of the Saxons that we have; and, secondly of its being the first Pointed architecture that this country ever saw: for the Pointed arch, first introduced into the arches of constructions as a measure of utility, and subsequently used into the arches of decoration, prevailed throughout its entire duration. To call any other than this period, either Early English or First Pointed, is then impossible. And to limit the application of these terms to this Early Pointed period, after their long use in another sense, appears to be equally so.

What is absolutely certain is, that we cannot go on as we are at present, with four systems of nomenclature used by different writers, and two or three used indifferently, as we have seen, by the same writer. How soon we shall arrive at the unanimity in this respect that is so desirable, is difficult to say; meanwhile our course is a simple and an easy one.

You have already recognised the advantages which an intelligible classification, and simple and definite terminology, bring to the student; and the rapid and suggestive manner in which their use enables you to seize upon, and retain the characteristic features of a building, to be utilised hereafter in the same way that the old masters themselves used them; for, rely upon it, they were students in the same way that we are ourselves.

To learn the grammar of their art was as essential to them as it is to us; and there is no reason why you, if you become as thoroughly imbued with the spirit and feeling of the style in which you design as they were, should not be as independent and as original.

It is true that there are some to whom originality is impossible: such men are condemned to copy; they have simply mistaken their calling. They belong to the residuum of which Sir Gilbert Scott speaks in the otherwise excellent address to which I have already referred, and from which I will read an extract, that I venture to think is not inapplicable to the objects of our present meeting, and to those who have attended it and others in this and former years. It embodies, at all events, the sentiments which led to the establishment of these annual excursions:—

"One valuable means of perfecting our knowledge of architecture, is by measuring, sketching, and studying over and over again such buildings as those we have now around us, till we have mastered their principles, and have thoroughly imbued our minds with the character of their detail. If we do this with anything like system we shall do. We ought, at least, to attempt it. Some of us have done so with more or less success. Unhappily we cannot afford to be so polite as to shut our eyes to facts. There is a residuum of architects who pay no attention whatever to the cultivation of their artistic powers: who are architects only in name, and whose works are a disgrace to the architectural works of the nation."

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"There is an admirable race of young architects coming up—men not much known, and very little patronised by the public, but men who are following up, heart and soul, the work which their predecessors have attempted—the revival of Gothic architecture in this country; and whether we are to go on to the natural end of our term, or whether we are to be sacrificed at the behest of newspapers and reviews, I hope it will be to the school of rising architects I have mentioned that our works will be committed, for then we shall have hope for the future."

DRAWING.

To be able to draw lines correctly on paper is as necessary as to be able to write, for all persons engaged in constructive works, and it was an excellent idea of the publishers to put into the hands of workmen something from which they may learn what they ought to have learnt at school, but "Drawing for Bricklayers" * will not do that. It is an absurd book, and the disappointment of the bricklayer who may have bought it, with the hope that from it he might learn to draw, may be imagined. A great portion of the book has no reference at all to drawing, and the instructions conveyed are of the most meagre description. The other part consists of extracts from Peter Nicholson and from General Pasley, and of some original remarks, such as that "*In England*, the bricks, when burned, are rather less than 9 in. long, 4¼ in. broad, and 2¼ *in. thick*." The London stocks are of about that length and width, but thicker, while the red Suffolk and the Midland Counties bricks are both wider and much thicker. There could be no objection to the size of bricks or anything else being stated correctly, but why go out of one's way to convey wrong information? "The white Suffolk may be called a London brick, whilst the red clay in Cheshire yields the red bricks used to so great an extent in that district." But the colour of the clay has nothing to do with the colour of the brick when burnt, which depends upon the chemical properties of the clay, and not upon its colour. A very yellow clay will make a red brick when burnt. The various kinds of bricks are pretended to be mentioned, amongst which are "concave bricks made flat on one side, like an ordinary brick, and hollowed on the other, *used for drains and water-courses*"! while the ordinary culvert bricks which *are* used for drains are not mentioned at all; neither are the Staffordshire blue bricks. Lintels, it is said, have a bearing of 1 ft. or 18 in. at each end, and a drawing of a door or window-head is given, in which the lintel is shown as resting on pieces of wood 6 in. square placed across the wall.

The author gives a curious illustration of how our money was spent in laying a barrel-drain at the Ordnance Barracks at Chatham. "The bricks were ordered to be cut and gauged," so that the ordinary radiating or culvert bricks seem to have been as unknown to the Royal Engineers, as to the author of this book.

It would have been, one would have thought, an appropriate instruction in drawing for bricklayers to have given some examples of the arrangement of house walls, both of small and large houses. The only examples of this useful kind of work given in this book is that of one villa, and in this the water-closet is placed as nearly as can be in the centre of the building.

"Drawing for Cabinetmakers"† is better, but it has one fault in common with the book above mentioned. They form two of a series, and the reader is frequently referred to some other book of the series for the information necessary to complete the understanding of the subject. This may be very ingenious, but it is unjust to those persons to whom the books are specially addressed. The position taken is one that ought to be worthily filled, and if no better information can be given than is to be found here it were better to say nothing. If criticism is to be worth more than the paper on which it is written we must not hesitate to condemn such books as these.

"The Art of Drawing what One Sees"‡ shows the *rationale* of perspective drawing. Here there is no writing for the sake of making a book, but every line tells its own story intelligibly, building up the structure of the book line upon line without confusion of ideas, and genuinely putting before the reader the author's views of the principles upon which perspective drawing depends, and reducing it to a science. Artists, or, begging their pardon, pseudo-artists, think they have nothing to do with science. In perspective drawing, however, they must proceed on scientific principles, and they will find them plainly stated in this book.

The manner in which the eye conveys to us the impression of the existence and relative positions of objects, the rays from which we receive into the eye, is wonderful. If studied

* Drawing for Bricklayers. By Ellis A. Davidson Cassell, Petter, & Galpin.

† Drawing for Cabinetmakers. By Ellis A. Davidson. Cassell, Petter, & Galpin.

‡ The Art of Drawing what One Sees. By Lieut. W. H. Collins, R.E., F.R.A.S. Longman, Green, & Co. 1872.

more closely it is astounding. Bacon said that Nature reveals but little of her charms to the stranger, and reserves the greater part for those who come again; and whether we shall ever understand her is a mystery, but she makes no mystery of herself to those who will seek to know her with diligence and humility. The want we find we have is that of intelligence to understand what we do see. That very important part of the actions of Nature which enables us to see and appreciate the relative positions of objects and to represent them on paper is well set forth in this book.

A perspective picture of an object, says the author, is an enlargement of the picture thrown on the back of the eye through the pupil, and interpreted by the brain. The perception of the object or interpretation of the little picture within the eye is *sight*; and the image itself, or an enlargement of it, is the perspective view (from *perspicio*, I look at).

"It is thought by a beginner that correct drawing is the result only of a correct eye, and that, like the poet's art, the peculiar faculty must be born with one, and cannot be acquired; but it is astonishing how soon the novice is capable of bringing rigid rule to bear upon the production of his own drawing, and upon the criticism of his master's. Master and he have then become pupils of Nature."

MANUFACTURE OF STAINED GLASS.

DURING a recent course of Cantor Lectures at the Society of Arts, Professor Barff treated of the manufacture of stained glass. The lecturer said, coloured glass is made in the same way as ordinary glass, except that certain substances are added to colour it. It is often said that the mystery of stained-glass painting is lost,—that the art which was once known to our forefathers in the Middle Ages has been lost. But this is altogether a mistake; there is nothing which they did which we cannot do. It is true that, after the decay of Mediæval art, up to about thirty years ago, the stained glass that was made was anything but like that which it was intended to imitate, viz., the glass which adorns the ancient cathedrals of this and other lands. You will understand this if you look at some windows in the Temple Church, which are extremely good for the time at which they were made. They were a decided advance in the right direction upon what had preceded them. I shall have to allude to them again, as well as to other windows, in the next lecture, when I speak of the styles of glass-painting. I cannot help referring to them now, for this reason. A gentleman, named Whinston, a barrister, was much interested in this subject of glass-painting, and studied it very carefully. He saw that there was something wrong in the treatment that was being adopted, and he desired to ascertain how it was that the old windows, which had been made so many years, were so different from these modern imitations of them. He, in conjunction with Messrs. Powell, of Whitefriars, to whom we owe entirely this revival of the ancient mode of making glass, set to work, and analysed the old glass, to see with what metallic oxides they were coloured, &c. They also examined carefully the method in which they imagined the old glass was made. Mr. Whinston examined old treatises on the subject. He read carefully a book by a writer of the Middle Ages, and a translation is given in the appendix to a work which he published. It is interesting to see how very similar the older methods were to those employed at the present time: yet there were differences. I will not go through a description of the various stages of their work: however, we owe them both a heavy debt of gratitude. Others may have taken up the same subject, and doubtless have; but they were first in the field, and the enterprise and intelligence which Messrs. Powell displayed in this matter are beyond all praise. They have furnished us with specimens of their coloured glass, and by means of these I hope to be able to illustrate to you the method of manufacturing glass suitable for church windows and decorative purposes of all kinds, and contrast it with that which is used for domestic purposes, and show you how it was that gradually stained-glass painting began to decline from about the end of the sixteenth century. If you look at this cylinder, which is a beautiful specimen of glass, sent by Messrs. Chance of Birmingham, you will see that it is most perfect in its manufacture, and all their glass in domestic uses is of this character, most carefully and beautifully made. But it is because the glass which those who revived glass-painting employed was so perfect in its manufacture, and so fine in substance, that much of the effect of the ancient glass-painting was wanting in their works. Various means were employed by architects and others to remedy these defects by covering the glass in places with opaque enamel, so as to give it an antique appearance, and also to get the lustrous effects which they saw glistening forth in the windows of the old artists. The effect of this was to cause darkness, and to destroy utterly that brilliancy which they hoped to attain.

Now, here is a cylinder of glass which is made for church windows. I dare say that even at this distance you can see that it is very imperfect on its surface, and irregular in its substance. The cylinder is not particularly true in its form, it is not even in its thickness, and the glass has not been refined with the same care as that which I showed you just now. It is full of air-bubbles and streaks; and if you look at a person through it, his features will be distorted in all kinds of directions. In fact, you cannot see at all distinctly through it. Now this very defect in the manufacture of glass for stained windows is its beauty. If you allow the light to pass through a sheet of glass, like this fine specimen, it passes through it uninterruptedly; but if you allow it to pass through this coarser glass, it is refracted, and this gives it its beauty and brilliancy. There, again, is another sheet of glass which will illustrate it better; it is full of striæ and air-bubbles. It is interesting to watch the course which the change in the manufacture of glass has taken in the last thirty years. All sorts of what one may call tricks have been resorted to to produce the effect of old and partly disintegrated glass. It was found, on examining the old glass, that it was full of little spots, or minute holes. I think I told you the reason of this in a former lecture, that it is because the glass is not perfectly homogeneous; some silicate, more alkaline than the rest which compose it, has dissolved out, which, you will remember, it does readily when water acts upon it slowly, and there is no doubt whatever that to this disintegration of a great portion of the old glass its pearly lustre and extreme beauty are owing. These irregularities in thickness all refract light, and cause it to stream through the glass as through a number of prisms, and thus we get a more lustrous and beautiful effect than we do when light is allowed to pass through a perfectly homogeneous medium.

Here is a specimen of patent-rolled plate-glass, which I allude to because I think it right to give all the credit to those who, by scientific means, have done anything to improve or advance this beautiful manufacture. This was invented by Mr. Hartley, of Sunderland, a glass-maker of great intelligence, who found out a very simple thing, that he could ladle out from a pot of glass a desired quantity, and throw it upon a table, and roll it. These marks which you see are from engraved lines in the iron table upon which it is rolled. This glass is very lustrous, and is often used in the manufacture of stained-glass windows. Mr. Hartley has also done much in the improvement of coloured glass. I will now describe how glass is coloured. Here is a piece of blue glass. It is what is termed pot metal; that is to say, the blue colour passes all through the substance of the glass. It is made blue in the pot. Here, again, is a piece of ruby glass, and in it you will see striæ and irregularities in its colour which make it so valuable to the artist. This glass is not coloured throughout its substance, but is simply coated on the surface. There are certain other glasses which can be coated; for instance, blue glass can be coated, because oxide of cobalt when used in quantity imparts a very deep blue colour to the glass, so that you can have a thin film of it covering white glass, and producing a deep blue colour. Again, greens and purples also can be coated, and they are all of them, I believe, to be obtained coated either in this country or from abroad. But ruby is always a coated glass. If you look at this specimen, you will see that it is perfectly opaque. It does not look like glass, but like a piece of red sealing-wax; it is coloured with the sub-oxide of copper. When the workman is making a disc or cylinder of ruby glass, he gathers upon the end of his blow-pipe, first, a piece of ruby glass, which is like this opaque glass, and then on the outside he gathers a quantity of white glass. He knows how to take the two glasses in proper proportions, so as to have a proper thickness of white and of ruby. He then blows and gets a globe, or cylinder, which is composed of white glass covered with a very thin film of ruby glass; and it is only when this ruby glass is seen spread out thin that you are able to see its ruby colour.

Here, again, is the material used in making another kind of ruby glass, which is very beautiful. This is ruby made with oxide of gold. Here, you see, is a mass of red glass, not particularly brilliant in colour, which is made in the glass-pot, and great care is required in its manufacture; for if it is heated too much the oxide of gold is destroyed, and is reduced to a regulized state, and metallic gold does not colour glass. A piece of this glass is attached to a blow-pipe, just in the same way as the other, and is coated in the same way with plain glass. I hope to have a small piece of this gold ruby here next week, that you may see its beautiful colour. I will proceed now to the subject of stained glass or glass-painting, and leave to my next lecture the colouring of glass in the mass, because next week we shall be able to make some coloured glass in small quantities; and, having the electric light, I shall be better able to show how the white glass is coloured then than I can do now. I could not commence the description of the method of staining or painting glass without first mentioning the way in which glass is coloured, because you will see, when we come to treat of the manufacture of stained glass windows, that there is, properly speaking, no staining whatever except in one instance; it is simply painting. It is called stained glass, but this is an incorrect name for it. This piece of glass is not stained: it is coated with coloured glass.

I have here a piece of yellow glass. It is stained with oxide of silver, and this is really the only stained glass which is used in windows. Other glasses are either coloured throughout their substance, or are coated. I shall this evening illustrate the method of staining yellow glass. This little furnace, which you see here, will be used for the purpose. I shall, I hope, be able to show you also a method by which a ruby stain can be obtained. Silver stain varies from a light straw-colour to a deep orange; but a ruby stain is, as its name implies, a true red. Here is a piece of glass which was coloured with a ruby-stain in this muffle, but as the heat was allowed to become too great, there has been a little metal reduced here, which spoils the colour in parts. It is very instructive to examine this, because it shows the importance of attending to temperature in all these operations. In making a stained window, the first thing to be done is to make the design. Here are some sketches of various designs for windows; these, as well as everything pertaining to stained-glass manufacture, have been lent us by Messrs. Lavers, Barraud, & Westlake, of Endell-street, artists who hold a very high position as glass-painters: it is, therefore, quite unnecessary for me to make any comments on the merit of their works. The first thing to be done is to make the design. After that the working drawings, or large cartoons, are drawn by the artist. You see here a series of them, which have been used in the manufacture of a stained-glass window, and here is the window which was executed from them.

The various black lines which you see are lead lines. When a cartoon is finished, tracings are taken from it, and thus you see how easy it would be for any one who has a talent for drawing to make first a small sketch, and afterwards to make the large cartoon. As to the taste required and the style to be adopted, I will not say anything, as I am now simply speaking of manipulation. There is nothing easier than for a person who can draw to enlarge the drawing afterwards. A tracing is made of the whole and of different parts of the windows, and it is from these tracings that the glass used in the window is cut. One tracing will serve both for cutting the pieces of glass required to make up the window and also for performing the operation of leading, of which you see a sample here. Here are the pieces of glass which were laid upon this tracing. It is very easy, when they are cut, for the workmen to lay them down in their places and join them together by means of these pieces of lead, in the way which I will presently show you. I now come to the most interesting and important of all the operations after the cartoon is drawn,—that is, the painting of the glass. Certain substances are used for the purpose of painting on glass. Here you see certain dark lines, indicating the shape of the design. If it were a rosette or a face, it would be outlined in

just the same manner. Mr. Yeoman, an artist from Messrs. Lavers, will illustrate the work before you. He will take a piece of glass, which he has got ready for the purpose, and will show you how the manipulation is performed. He will put upon it a colour, the composition of which I will describe, and afterwards I will put it into this muffle, and fire it before you. The material with which Mr. Yeoman is going to paint is opaque. It is quite clear that if much of that material were used, the transparency of the glass, the property for which we most prize it, would be destroyed. Therefore, an artist who knows his work is as sparing as he can be in the use of this material, provided he can produce the effect which is desired. The material is made of various oxides of iron which are infusible, which do not enter into chemical combination to any appreciable extent with the fluxes employed, but which are simply held in suspension by them, and which are fixed on the glass when the fluxes are fused. There are different ways of making fluxes, and in my supplemental lecture I shall have an opportunity of showing you new methods of making them, by which they can be easily produced, and rendered very fusible; and where the flux is required to be coloured so as to be transparent, it can be so composed as to insure this effect at the temperature which is at our command. The bases of most fluxes are borax and oxide of lead. Borax is a substance which renders the glass fusible, and so also is red oxide of lead. Many prefer to use the lead and the borax in chemical combination, and for this purpose they precipitate a solution of common borax by a solution of lead nitrate, and they then get a lead borate, which makes an exceedingly good flux; but there is always a drawback to the use of borax as a flux for painting stained-glass windows. I do not know whether you have ever noticed it, but if you look, you may notice on the outside of many modern church-windows a white mildewed appearance upon the dark brown colour with which the glass is painted. If the glass, by any accident, gets placed the wrong side outwards,—and that sometimes does happen, when it is painted on the wrong side,—the painted portion is exposed to the action of the weather: this and the moisture in the air cause the borax to dissolve slowly, so that the flux which fixes the colour upon the glass is to a great extent destroyed. I have seen many works of really distinguished artists in which some of the lines and shading of the faces have disappeared altogether, owing, no doubt, to the fluxes being made soft with too much borax.

WORCESTER GUILDHALL COMPETITION.

THE town council met last week to receive the report of the Survey Committee, recommending as we have already mentioned,—

"That the set of plans for the re-building, sent in by the architect under the motto, 'Bakalum,' be awarded the first premium of 100*l.*, on the distinct understanding that the architect guarantee that the proposed building, exclusive of the tower, and of sculpture and enrichments shown in the exterior perspective, which, as the elevations show, are not necessary to the design, can be carried out for the estimate sent in; otherwise the premium to be withheld.' 'That the set of plans sent in by the architect under the motto, 'Fiat Justitia,' be awarded the second premium of 50*l.* on the same conditions.' It was resolved unanimously,—'That, there being only two sets of designs for the re-construction, and this committee having previously reported that 'Convenience' had not complied with the conditions, they therefore presume that the premium must be awarded to the architect signed 'Vincit Veritas.'"

Mr. T. R. Hill said the council should not commit themselves to the award of the premiums until they were satisfied that the requirements of the advertisement had been complied with in respect to time. He would ask the town clerk whether they would be acting strictly according to law in making the award until it had been ascertained that those terms had been complied with.

The Town Clerk said, I know as a fact that *Bakalum's* was amongst the first six. I cannot answer the question as to one of the others.

Mr. Airey was glad to hear that this design was one of the six delivered within the time stated in the advertisement, having been strongly of opinion that the council had committed a mistake in admitting the three received late to competition, and especially so after hearing the very decided opinion of the editor of the *Builder*. He hoped the second was also one of the six; and that care would be taken that they had a *bonâ fide* guarantee as to the cost.

The recommendations of the committee were ultimately adopted. The letters giving the names of the authors of the plans were then opened, and it was found that the three designs were sent in as follows:—

Bakalum.—Mr. C. G. Wray, 46, Cannon-street, London.

Fiat Justitia.—Mr. E. C. Robins and Mr. G. F. Roper, 16, Southampton-street, Strand.

Vincit Veritas.—Mr. E. A. Day, Worcester.

SLAG AS A BUILDING MATERIAL.

EVERY visitor to the neighbourhood of iron-works is struck with the enormous accumulations of unavailable product, and is almost sure to inquire, "Can nothing be done with it?" Numerous plans of utilising it have been propounded, many in our own pages, but still there lie the mountains of slag added to by every month's work. At the American Institution of Mining Engineers a paper on the subject was lately read by Mr. S. Egleston, a portion of which we reproduce.

The necessity of having building stone in certain countries of Europe, where it is very scarce, led to a long series of experiments, which, after a multitude of failures, resulted in the manufacture of a very useful product for certain kinds of constructions. These experiments began at a charcoal blast-furnace, the slag from which was taken out of the fore-hearth with a ladle compressed into a mould, and cooled slowly. In order to keep the slag in the hearth from becoming cool, it was covered over with charcoal. A small quantity of the powder of the charcoal became mixed with the slag, and effected a partial devitrification in the moulds. The attempt to apply this exceedingly simple process to a coke furnace failed entirely. The bricks became too porous from the evolution of gases resulting from the admixture of coal-dust. Sand and coke-dust were then substituted, but as the bricks were still fragile they are now annealed in furnaces. This process is applied in Konigshutte, in Silesia, to the manufacture of building material, of which some of the important constructions of the works are built. The slag is run from the furnace into a hemispherical basin on wheels. The bottom of this basin is covered with sand or fine coke-dust, to the depth of about three centimètres. The wagon is then drawn to the point where the bricks are to be made. The slag and sand are mixed together with a curved iron tool until most of the gases have escaped, and the mass is about the consistency of dough. It is then drawn with the same tool into a mould with a hinged cover, and punctured several times to let out the gas. The cover, which fits into the mould, is then turned down, and the slag compressed. By the time three or four moulds have been filled, the first slag brick is sufficiently solid to be removed. This is done by raising a clamp, which allows the mould to separate. The red-hot brick is now drawn into a kiln, covered over with powdered coal, and left to anneal. Each kiln contains 1,000 bricks, and is from three to four days in cooling. Four men can make 500 of these bricks in five hours. The loss in the manufacture from the breakage is about 20 per cent. The cost of annealing is about two thalers per 1,000. These bricks are rough on their surfaces, but, on account of their larger size, do not require more mortar than ordinary bricks. They do not readily absorb moisture, and for that reason are extensively used in the construction of foundations. The pillars supporting the main wind-pipes at Konigshutte are built of this material. In Silesia these bricks cost 25 per cent. less than ordinary brick.

A brick much inferior to this in every respect is made in the Hartz mountains out of the lead furnace slags, which are silicates of iron. These are moulded and compressed, and are used for buildings. As the bricks are very brittle, the constructions in which they are used are generally covered with a coat of mortar. The buildings of the immense mechanical preparation works of Clansthal are built of this material.

Mr. Sepulcre, a Belgian engineer, was one of the first who successfully transformed the slag into a stone which could be generally used. This he effected by causing the slag-channels to terminate in an excavation, the sides of which had an inclination of about 30°, and with a capacity varied from half to ten cubic mètres. The very steep inclination of the sides causes the section of the pits to increase very rapidly, and this allows the solid crust, which forms on the surface of the liquid slag, to rise with it without becoming attached. The slag must flow continuously into the excavation; and if, from any cause, there is an interruption, the crust must be raised to allow of the liquid material flowing underneath. In this manner the whole mass of slag in the pit is sure to be all liquid, and will solidify from above and under pressure. After the excavation is full, it is left for five to ten days to cool, the only precaution required being to cover the top with ashes or sand to a sufficient depth to prevent the mass cooling too rapidly. The stone so produced grows hard on exposure to the air. When first made it can be easily broken into any required shape, but after exposure for a period more or less long, it becomes so much harder as to require double the number of tools to work it.

All kinds of slag are not suitable for this manufacture; those which contain too much lime fall to pieces on exposure. In general, it may be said that they should contain from 38 to 44 per cent. of silica, and that the furnace should be working well.

According to experiments made at the Conservatoire des Arts et Métiers, in Paris, this stone, when made from slag; while the furnace was running on white iron, never became fissured under a pressure of less than 242 kilogrammes the square centimètre, and was crushed at a pressure of 886 kilogrammes as a minimum. When made from gray iron, they do not crush under a pressure of less than 405 kilogrammes, but they have fissures at a pressure as low as 222 kilogrammes, or a little less than the white iron slags. This material is, therefore, stronger than the best marble.

One of the Belgian furnaces, which produces 2,500 tons of slag in thirty days, made from it 1,177 cubic mètres of stone. The expense of manufacture was 820 dollars. The material sold for 1,600 dollars, making a profit of 780 dollars in thirty days; 70 per cent. of the slag produced was profitably used. In order to introduce it the price was put 25 per cent. lower than ordinary stone.

BLACKPOOL MARKET COMPETITION.

FORTY-SEVEN sets of designs were sent in, and these were referred by the Local Board to Mr. Jas. Green, architect, of Portsmouth, near Todmorden. In his report, just now adopted by the Board, Mr. Green says:—

"Out of the remaining designs I shall notice six especially for your consideration, viz.:—Nos. 5, 7, 17, 21, 29, and 36.

In considering the six designs, I have no hesitation in recommending to your notice that of No. 7, bearing the motto 'Mercurius,' as worthy of the first premium, both on account of the arrangement of market, which is well lighted and ventilated, also shops and offices, and the excellent style of elevation it presents. I estimate the cost of carrying out this design in its integrity, including the handsome clock tower, would not exceed 7,500*l.* The tower would absorb about 400*l.* of this sum; but as it forms so great a feature in the design, and would be at once so useful and ornamental an acquisition to the town, I should strongly recommend the committee, if they decide to accept this design as the first, to carry out the whole as drawn.

For the second premium I select No. 17, bearing the motto 'Knowledge is Power.' This I name as having an excellent arrangement of plan, both of market and offices. The elevation I consider not so good, but the author has evidently considered the amount to be expended, and I think has not exceeded the amount in his design.

For the third premium I select No. 21, with the motto 'St. Swithin,' which has a much superior elevation to the last mentioned, but is not so good in plan, having less light and ventilation to the market, and not so convenient a board-room. I think the cost of this would not exceed 7,000*l.*"

The premiums were accordingly awarded as follow:—

First, 30*l.*, No. 7, "Mercurius," Messrs. W. & J. Hay, Liverpool.

Second, 20*l.*, Mr. Charles O. Francis, Liverpool.

Third, 10*l.*, Messrs. Thomas Bird & Son, Manchester.

"LANDS THAT WANT HANDS."

SIR.—If the statement be true that "men who eat and drink well ought to work well," the converse is also true, that "men who work well ought to eat and drink well." Experience teaches us, that unless men do eat and drink well they cannot work well. It is as vain to expect the contrary as that the steam-engine shall work without the burning of fuel. No matter whether the labour be mental or physical, brain labour or muscular exertion: it has been abundantly shown that men cannot perform it unless they live well. Now, living well involves a good supply of animal food,—meat. Unless men eat plenty of meat they cannot do plenty of work. It will not, then, be a matter of surprise

in these busy times, when great exertions are being made, and labour performed at railway speed, that there should be a great demand for meat; and also that, in consequence of that demand and the very natural wish of those who have meat to sell to share in the general prosperity, meat should be at a high price. It would be a matter of surprise if, under these circumstances, meat was cheap; but a very general impression has got abroad, especially in our cotton counties, that meat is much dearer than it need be, that cattle-breeders are getting more than their fair share of profit, and have by some underhand backstairs way induced the Government to protect them in their dealings by prohibiting the importation of foreign stock, ostensibly, it is true, on account of disease, but really to prevent competition. It would be well if this impression could be explained away. From a statement recently published it appears that our meat supply is derived mainly from our own soil, and that we import to the extent only of some 5 per cent. of the whole. If that be so, the cry recently raised requiring the Government to remove the restrictions against the importation of (diseased) cattle seems uncalled for. Let us have free trade in (healthy) cattle certainly, but let us not be deluded by the belief that other countries in Europe will have much to send us. Denmark used to be our great source of supply; but ever since the German hosts were launched into Schleswig Holstein, there to acquire that appetite for beef which has later swept the face of fair France of its cattle, and which appetite is not likely to be appeased, now that the splendid feeding-grounds of Denmark and France are "annexed," we shall, in all probability, get next to nothing from them. Spain, too,—sleepy Spain,—sends us a few cattle; but let the spirit of enterprise get abroad under a vigorous Government, and Spain will want all its cattle for its own use. We clearly cannot depend upon these. On whom, then, are we to depend for our meat-supply? Not on our colonies; for, in spite of the noise made with their tins of preserved meats, the bulk of the people will not be satisfied with them. "*It no fill him belly*"; and no foreign country offers anything better. It is clear we must follow the old advice, "If you want a thing done, do it yourself." We must depend upon ourselves. Already a great stimulus is given to production by high-selling prices. Farmers will do their utmost to meet the demand, by growing root crops instead of corn, which can be well imported, and by hesitating to send their calves to the butcher. Government may do something in that direction also, by prohibiting the slaughter of calves and lambs under a certain age; for why should not these have a "close time," as game and wild-fowl have? These remedies to scarcity will do something, but they will scarcely do enough. We want more people to live in the country, following agricultural pursuits. *We want a peasant proprietary.* Looking over the volume of the *Builder* for 1870, I have been much impressed with your remarks upon this subject. I can avouch that there are in this England of ours abundant "*lands that want hands*," for I have gone through a great portion of it on foot, and have observed the manner of its cultivation, and also of its waste; and, as a result of my observation, I may affirm that, leaving out the 30,000,000 of acres now uncultivated, if the remainder, said to be cultivated, were in good hands, and under the management of intelligent peasant proprietors, our country would produce for us in abundance everything,—except tropical productions,—of which we stood in need. Not only that, but there would be an immense improvement in the people themselves. Our town artizans, many of whom have been country bred, but who are mostly only one degree removed from starvation, would be infinitely better off as cultivators of their own land, although its extent be no more than that of Miss Martineau,—a farm of two acres. A man need not cease to be an artizan by such an acquisition. A good system of light railways throughout the country would keep him in sufficient connexion with his employers; and it will require no stretch of imagination to see that a man with his family so situated would be practically above the reach of want.

And now let me repeat your question, "Who will help us to such a position?" There are large numbers of us scattered about the country who mean to have it, either in our own or some other land,—men with large families, who would be welcomed in any country except our own.

The United States are absorbing a large number of our best workmen; and Canada, our own colony, is not only offering to us such inducements as the possession of good land gratis, but is also paying for us part of the cost of reaching it. In these countries men think themselves hardly used if they do not eat beef or mutton three times a day and every day. There every country family, and many town ones, possess cattle, so that they get a good supply of fresh dairy produce,—a luxury which we town-dwellers in England seldom or never obtain.

Will not some noble lord or honourable gentleman who is in possession of a portion of the surface of this land of ours put some of us with large families into possession of, say two to three acres each family, at an equitable rental and a long lease; the first three years at a peppercorn, gradually rising to the full rental at the end of ten years, or as may be determined by the merits of the case? We can pay a good rental; we can pay more per acre than any tenant-farmer in the country; and we shall produce more, take us altogether. We shall have no strikes and no starvation, and, consequently, no poor-rates and workhouses, and I am quite sure we shall want no lunatic asylums. But we shall want good, healthy homes, and large storehouses for cattle and crops, and good schoolhouses for our children. We shall want, and shall be able to have, many things of which we can only read and dream now.

Our cry, then, is "Back to the land; back to the land! Who will be the first to start a home colony on the '*Builder's* plan' or any other?"

E. G.

SCHOOL BOARDS.

London.—ON June 26th the Works Committee were instructed by the Board to take the necessary steps to invite a competition of four architects for the Board offices, to be erected on the Thames Embankment. They have submitted the conditions and particulars which have been drawn up for the guidance of the competing architects.

Conditions and Particulars.

The School Board for London invite competitive designs from the four selected architects for the offices to be erected on the Thames Embankment site, near the Temple Station, a lithographed plan of which is herewith sent.

A schedule of the probable accommodation required is appended, but the competing architects are invited to submit suggestions.

An honorarium of twenty-five guineas will be paid to each of the unsuccessful competitors.

Each architect to give the cubical contents in feet of the whole building, measured from the bottom of the foundations to half-way up the roof; the available internal superficial area of each floor, as contained in the rooms; and an estimate of the cost, together with a general specification and description.

The Board reserve to themselves the right of rejecting the whole of the designs, should none of them be considered suitable.

The plans, drawn to a scale of 8 ft. to an inch, to be delivered to me not later than 5 p.m. on Saturday, the 30th of November, 1872.

With reference to the appointment of officers for the architect's department, Mr. Tabrum explained that the altered arrangements as to the services of the architect would involve a saving during the first year of 25,000*l.*, and as the architect would have thirty sites placed at once in his hands, the committee thought it desirable that he should have a sufficient staff.

Brighton.—The Education Department have approved the designs of Messrs. B. Fletcher and J. S. Nightingale for the schools in Ivory-place.

SEWAGE WORKS AT BUCKHURST-HILL.

THESE works have been carried out under the direction of Mr. Grindle, of Hertford, and have been in successful operation for nearly twelve months. "The population of Buckhurst-hill," says the *Woodford Times*, "is about 2,000. The sewage is very strong, being nearly double the strength of ordinary London sewage. Originally an irrigation farm was thought of, in deference to the frequent visits of London excursionists, and the high price of land, the Sewer Authority decided on adopting a system of precipitation combined with intermittent filtration as recommended by Dr. Franklin. The raw sewage is taken to the subsiding tanks from the main sewer down the Queen's-road to the works which are situate about 300 yards below the railway station. On its way to the tanks it is treated with sulphate of alumina to assist subsidence; it is then received into a tank 30 ft. long, 12 ft. wide, and 5 ft. deep, in which the solids fall quickly to the bottom. These tanks are frequently cleansed by means of valves and pipes in the bottom of the tanks, which convey the sewage mud to drying beds. This frequent cleansing is found necessary to prevent secondary decomposition taking place, and so further polluting the supernatant liquid. The surface of the liquid is always maintained at one level, so as not to allow any disturbance of the partially settled solids, the liquid being gradually delivered upon a sand-filter 20 ft. square, containing 1 ft. in depth of sand. From these sand-filters, the liquid, being deprived of all matter in suspension, is run upon one of four beds of calcined earth, 40 ft. square, and 6 ft. in depth. It is allowed to pass through one of these beds for eight hours, and so on the others alternately, thus giving each twenty-four hours' rest for the purpose of allowing the air to follow the sewage to oxidise any organic matter contained in solution. The effluent water runs direct into the River Roden, clear and sparkling. The works are in duplicate, so that no delay may take place during the cleansing of the several tanks and filters. The use of alum is to coagulate the albumenoid portion of the sewage, and to assist in its precipitation."

PAVEMENT IN PALL-MALL.

SIR,—I should like to draw your attention and that of the parishioners of St. James's, Westminster, to the relaying of the foot-pavement on the south side of Pall-mall by the authorities of the parish. PEDESTRIAN.

CANTERBURY CATHEDRAL.

ONCE more a priceless treasure has been imperilled by the plumbers. All England has heard with a thrill that on Tuesday morning last the east end of Canterbury Cathedral was in flames, and that, but for great and judicious personal exertions, and the most fortunate circumstance that Canterbury has a high-pressure water-supply, the building could scarcely have escaped. As it is, the damage is mainly confined to the roof, and is merely a question of money. The circumstances of the fire, and the considerations that grow out of it, may be better treated of as a whole on another occasion.

KENILWORTH IN 1872.

WHO but a wealthy English nobleman can indulge in the luxury of nursing the decrepitude of a shapeless ruin, and letting seven acres of land lie untilled? That some are to be found at the present time who are rendering this service to mouldering walls and mounds of earth is in itself, in the eyes of archæologists, a sufficient justification of the peerage. But the English public is not without its obligations to these same nobles; for were it not for them, how seldom would John Bull see with his bodily eyes the actual records of the great past of his country; and in all probability we should not be able to take our stand with quiet pleasure in the base-court of ruined Kenilworth. We owe our thanks, then, to the Earl of Clarendon for the very evident care that is constantly bestowed upon all that remains of Kenilworth Castle. We could wish that there were fewer printed notices posted on the walls to warn the climbers off them,—fewer spikes and rails at every turn and corner,—a less evident preparation for the reception of excursionists. But, above all, we wish away the disfiguring additions of modern masonry, especially where they take an ornamental form, quite uncalled for and most unwelcome to the eye that dwells with interest upon the old stonework. The architectural value of the ruins is not great, and cannot for a moment be compared with their historic worth. There are to be found no such delicate and varied details as gem the broken walls of Tintern or Fountains Abbey. Of true detail there is little or none. The huge pile known as Cæsar's Tower is austere in its plainness. The tottering wreck of what remains of Leycester's Buildings presents, indeed, towering rows of mullioned windows in the walls and in projecting bays; but the details of these are coarse and scanty. Only in the ruins of the Great Hall, in its grand porch, in its windows and its beautiful oriel, is any approach to refined architectural detail to be discovered, and even here its distinctness is obliterated by long exposure and by reason of the soft nature of the reddish sandstone of which the hall is built. The architectural student will find, then, little here to fill

his sketch-book. The ruins are too essentially picturesque and shadowy to afford many determinate features for him to seize upon. The artist with his colours is the proper person here, and for him how many charming and affecting subjects are presented in the great circuit of what remains of Kenilworth. But detail apart, the architect may find much to instruct him, especially in the disposition of the various masses of building, and in the shapes and aspects of the different halls and chambers. The natural beauty of the site is great, but the old builders have made the most of it; and in spite of the thickness of the walls and the narrowness of many of the windows,—in spite of vaulted ceilings and turret stairs,—when the castle was entire there could hardly have been a corner of it that was not cheerful except the dungeons. Of how many modern houses, with all their lightness, can this be said? Two of the windows on the western side of the great hall are recessed, and look over towards Honily. Before Cromwell gave the castle up to be spoiled by his followers, these windows looked on to a vast lake, which stretched away from the base of the outer walls into the dim distance, the wooded neighbourhood of Honily. From day to day the idle courtier or the proud lord of the domain could command from these lofty traceried windows as fair a view as could be found in England. And when the Princely Pleasures were held at Kenilworth, the mighty Queen herself no doubt often rested upon the broad stone seats beneath them, while Leycester pointed out to her the various beauties of the lake and the encircling trees of the chase beyond it. Two more charming windows could scarcely be found. A ceaseless flood of daylight once poured through their glazed and jewelled traceries, and still continues to pour through their bare ruined openings. The summer breezes that blew through their opened casements must have been bewitching, for they are bewitching still. The entrance to the castle is now by the side of Leycester's Gatehouse. Before the Gatehouse was made into a dwelling by Hawkesworth, Cromwell's officer, the road passed through the centre of it under an arch 12 ft. wide. This building is well preserved, and is inhabited as a farmhouse. The path to the castle is on the west side of it. A gravel walk, with flower-borders on either hand, conducts you through a gate or two into the grassy base-court, which rises rapidly to the foot of Cæsar's Tower on the right and Leycester's Buildings on the left. Passing through the broad opening (once covered with buildings) between these two masses of ruin, the great hall with its fine oriel immediately faces you, and all that remains of Leycester's Buildings is on your left hand. At the northern end of the great hall stands the famous strong tower, which Scott in the romance calls Mervin's, and makes it the retreat of the unfortunate Amye Robsart when she ventured to drag her wrongs and sorrows into the unsympathising presence of the princely pleasures. To take his seat in the midst of these ruins on a long summer's afternoon, on a day when there is no excursion to the castle, is productive of mingled sensations in the mind of the visitor varying with the natural bias of his thought. Around him rise the symbols of a power which is no longer such, but very weakness, for the feudal age with its chivalry has passed away. Here are the stern remnants of walls as old as the Conqueror side by side with the tottering fragments of others that were brand new in Elizabeth's time. History for a season made her home here in the persons of mighty kings and of almost as powerful subjects. The flower of our race, and the leaders of our nation, assembled here, just about 300 years ago, to take part in one of the most glittering pageants of which there is any record, when, for many days in succession, a gorgeous throng filled every nook and cranny within the great circuit of the walls, and eddied with its sparkling waves about the person of the virgin queen. We look up at the windows where beauty once took her stand to gaze at the life and bustle of the great courtyard below, or to catch the breeze from the surrounding lake. The windows are dark now, mere voids, and the ivy clambers about their broken mullions. We sigh over the departed life of our ancestors, even if we believe it to have been inferior to our own. But we cannot sympathise with it: we belong to another age; we are mere spectators here. The strength of stone and the tenacity of mortar have preserved these records of life in the sixteenth century for us to look upon, but we can do no more. The resistless current of change has borne us so far from these ancient landmarks that we feel like strangers and aliens in their presence. What have the men of to-day, whose familiars are steam and lightning, and whose politics are verging on lawlessness, in common with the men who reared these walls?—whose powers, as compared with theirs, were as the quiet dying out of a summer's day in contrast with a storm in the tropics? Of what real value, then, is an hour spent at Kenilworth to the active worker in this present age, and primarily to the architectural worker? The good of such a visit is surely for his heart, and scarcely at all for his art. If rightly viewed, ruins such as these, with the reflections they give rise to, will teach him, amongst other things, how utterly his age is severed from that in which these mighty buildings were executed, and that he must look for the sources of the power and beauty he is fain his art should display elsewhere than in dried-up fountains.

S. D.

TASMANIAN WOODS.

TASMANIA has woods which might usefully be introduced to the English market. A discussion has been going on recently in Tasmanian papers on the subject. The *Launceston Examiner* says:—

"We have immense forests of both hard and soft wood, as solid and enduring as British oak, as soft and more lasting than American pine. Practical men pronounce Tasmanian blackwood to be quite equal to mahogany—some say it is even better; it is pleasant to work, after seasoning will not shrink or warp, is everlasting, and may be had in planks 3 ft. or 4 ft. wide. Our gums, especially the blue gum, are in no way inferior to oak, either for strength or durability; while our pines—the Huon, celery-top, sassafras, and pencil—are equal to any in the world. Besides which we have fancy woods in great variety, most elegantly marked, and capable of receiving a very high polish. We should like to see some of the woods we have mentioned introduced into the English market. Manufacturers would hail them with delight if they could once be persuaded to give them a trial, and thus a trade would spring up that would be of mutual advantage to the old country and the colony. One of the principal objects of international exhibitions is to show the resources of different countries—what they have to sell, and, by inference, what they are likely to buy. We think it can scarcely be doubted that Tasmania has suffered through not being properly represented at the various exhibitions that have been held in Europe."

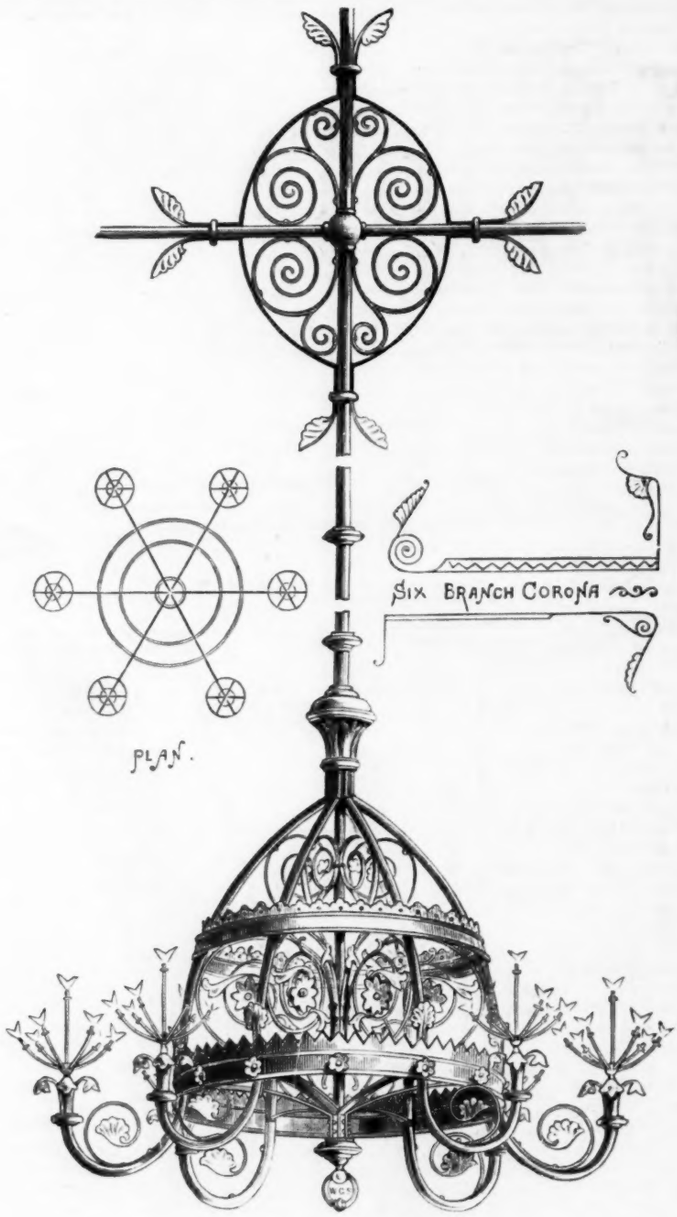
All bear testimony to the valuable character of some of the timbers, especially blackwood, for nearly all purposes for which timber can be used, from post and rail fencing to the veneering of the most delicate cabinet work. Blackwood (*Acacia melanoxylon*) is certainly a most beautiful and very useful description of timber. It is as handsomely grained as mahogany, and takes a high polish, so that to the cabinet-maker it is an invaluable timber. Furniture of all sorts is now made from it, while it is also largely used for interior fittings, for window sashes, and carriage work. This timber should, if properly introduced, command a high price in the English market, and it is worth the attention of those in the trade.

THE LIGHTING OF SCHOOL-ROOMS.

A PAPER "On School Life in its Influence on Sight," read recently at a meeting of the College of Preceptors, by Mr. Liebreich, Ophthalmic Surgeon in St. Thomas's Hospital, deserves the attention of architects and school boards. We print a portion of it, in which the writer speaks of the position of windows in class-rooms:—"The Education Department in its rules to be observed in planning and fitting up schools, has made regulations for the lighting of class-rooms, and has chosen, of all the different kinds, the very worst. No. 15 of the rules is as follows:—'The windows should be so placed that a full light should fall upon the faces both of the teachers and of the children.' Light coming from the right hand is not so good as that from the left, because the shadow of the hand falls upon that part of the paper at which we are looking. Light from behind is still worse, because the head and upper part of the body throw a shadow on the book; but the light that comes from the front, and falls on the face, is by far the worst of all. In the first place, it does not attain the object desired; and next, it is most hurtful to the eye. The object is to make the fully-illuminated faces more visible to the master; but the children, instinctively desirous of avoiding the unpleasantness of the full glare, assume all sorts of positions, which turn their faces *from* the master. In reading, they turn the head round the vertical axis, generally towards the right, in order to let the light fall on the book, which, when held straight before them, is completely in shadow; while in writing, or in reading (the book being on the table), they bend their heads as low as possible, in order to shade their eyes by the projection of the forehead. In this way the faces are much less visible to the master than if they were held upright and illuminated from the left side; and if, according to the regulations of the Committee of Council, the light also falls full upon the face of the master, he will be entirely prevented from seeing them. This method of lighting the room is very injurious to the eye, because, firstly, the retina becomes fatigued by the full glare upon it, and the diffused light renders the comparatively dark images of the printing and writing more difficult to be perceived. Secondly, the position assumed by the children, in order to avoid the disturbing influence of the light, places the axis of the eye in a very unfavourable direction, which, as I have already mentioned, and shall explain more fully by-and-by, induces short-sightedness, differences in the sight of the two eyes, and certain weaknesses of the muscles of the eye. The motives of this diversity in the lighting of rooms cannot easily be given, as they are different in almost every school. I will, however, mention a few of the more prevalent. Some of the principal schools are in buildings, two, three, and even four hundred years old. Here the windows are not in the most desirable positions; comparatively speaking, however, the lighting in the large class-rooms is very good. They have high Gothic windows, and the light falls through them more directly from above. The more directly the light falls from above, the less is felt any fault with regard to the side from which it comes. In small old buildings the lighting is frequently very bad. This would have been of little consequence where the old building serves merely as a nucleus for new ones, were it not that the unfortunate idea of building the new part in the old style has deprived the children of the favourable opportunity of obtaining several well-lighted rooms, in addition to a small number of badly-lighted ones. If we have to condemn this sacrifice of a most important object to architectural taste, what shall we say when one of the first architects in England builds, at an enormous cost, a perfectly new, large, splendid school on an extensive piece of ground, open on all sides, and lights every class-room from three sides at once by low broad windows; thus rendering it impossible to place the desks in any suitable position? Are trustees and architects aware of their responsibility, when they build a school without consulting the masters, and only for outward show? Or have they no misgivings of the evil consequences resulting from such unpractical arrangements in a school? In the schools of the middle classes I have generally found better arrangements with regard to light, especially where limited means did not allow the architect to ornament the house in the Tudor style, in which the upper part of the window, *i.e.* the most important, is useless, but obliged him to build in a simpler manner. Buildings with rectilinear and rectangular ground plan, with high, rectangular modern windows, do not produce such a pretty effect in the landscape, and do not proclaim the genius of the architect to the superficial beholder; but this seems to me of small consequence in the case of institutions of such practical importance as our schools. In the schools for the poor, where the light depends essentially upon the situation and means of the school, and where the first is often unfavourable and the latter limited, no one can be blamed for the lighting, which is generally insufficient rather than ill-arranged."

CATHEDRAL OF ST. CANICE, KILKENNY.

THIS cathedral is the see of the Bishop of Ossory, a diocese which embraces nearly all the county of Kilkenny and portions of the Queen's and King's counties, in the province of Dublin. Originally seated at Seir-Kyran, in the King's county, the bishops of Ossory subsequently had their see at Aghaboe, in the Queen's county, but it was finally removed to Kilkenny at the beginning of the thirteenth century. Commenced early in that century, and finished about 1280, this cathedral is in style a pure Early English building, and is said to bear strong tokens of affinity to the South Wales school of that style. The plan is cruciform, with a tower at the intersection of the cross. There are aisles to the nave and to the western portion of the choir; the former having lean-to roofs, the latter being gabled. Besides the choir aisles which served as chapels (the piscinæ and credences still remain), there are two chapels opening eastward from the transepts; that to the north served as the parish



CATHEDRAL OF ST. CANICE.

church, and is plain and small; the southern chapel is much larger and more ornate. It has three closely contiguous three-light lancet windows to the south; the lancets being mullioned, and each triplet contained by shafted piers and a moulded internal arch. Its earlier window consists of three similar lights of two lancets each, the central light rising considerably above the side ones. It may safely be assumed that this chapel is later than the main structure, as, if the heads were pierced, the windows would be examples of plate tracery. The choir is lighted by lofty lancets grouped in threes in the east end and at each side, and separated by massive piers with moulded trefoiled heads (over round-headed windows) and jamb shafts; over the roofs of the side aisles five clearstory windows admit light also to the choir.

The original tower fell early in the fourteenth century, and has been rebuilt, with a curious, though not servile, adherence to the style of the previous century. The fan-tracery of the tower arch could not, however, have been erected until the fifteenth century. It is said to have been the work of Bishop Hacket, reputed to have designed the Abbey of Batalha, in Portugal, and is the only bit of Perpendicular work in the entire building.

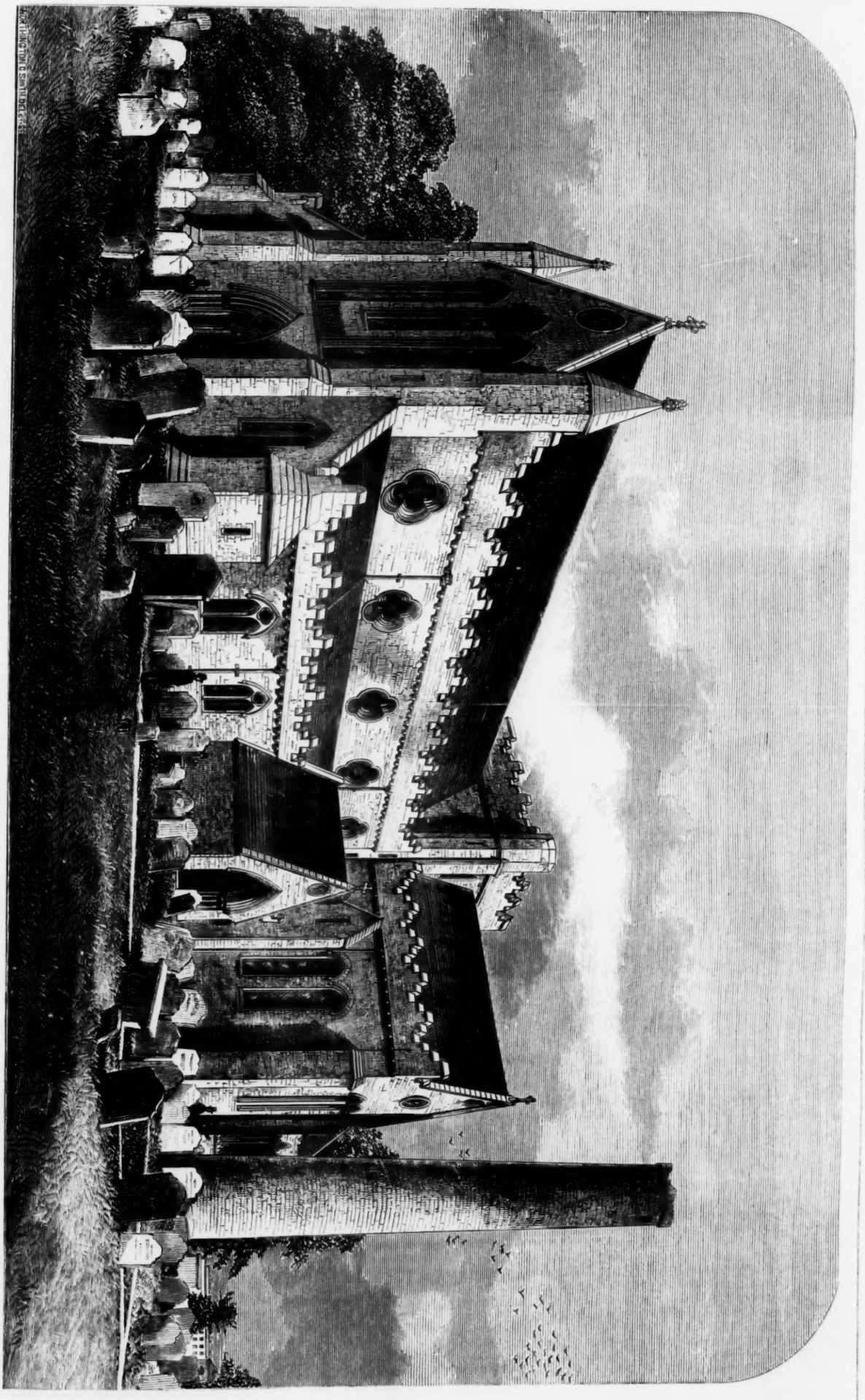
The external aspect, as may be seen in our view, is plain, but pure Early English work. Notwithstanding the plainness of its style, and its comparatively small size, the cathedral, both internally and externally, is not without a certain degree of massive grandeur. It was restored and roofed by the Dean and Chapter just previously to the disestablishment of the Irish Church, at an expense of about 15,000*l.*, of which the greater portion was borrowed on the credit of the Economy Estate, 3,000*l.* were advanced by the late Ecclesiastical Commissioners for Ireland, and 400*l.* subscribed by private persons. The architect was Mr. Thomas Newenham Deane, whose work is not very happy where he had not the ideas of the old architects to guide him: notably in the sheeted hammer-beam roof of the choir, and the bishop's throne and stalls. The adaptation of stone water-courses to the exigencies of modern work has not been successful, as they leak under the wall-plates, and have already caused the unavailing expenditure of several hundred pounds in the endeavour to make them water-tight.

The church is plainly floored with Minton's tiles and Irish marble, and seated with movable open benches, the sittings being entirely free. It is lighted by a series of part-polished and part-painted large coronæ, suspended from wrought-iron ornamental tie-rods, and supplied by Messrs. Richardson, Slade, & Co., of Brownlow-street, Holborn: one of these coronæ pendants we have illustrated. The pulpit and most of the carving of the new work are by Harrison, of Dublin. There are four principal doors: a very fine double door to the west, of an ornate character; one with a porch, giving entrance to the south side aisle of the nave; one in the north side aisle of the nave; and one in the north transept. The last-mentioned exhibits a round-headed entrance under a moulded pointed arch, and is considered the most curious feature in the church: unfortunately it suffered much from injudicious *cleaning* some years ago, as did also the finely-moulded arches of the nave arcades. The stone principally used in the dressed work is Kilkenny marble, or mountain limestone, of a dolomitic nature; a good deal of local sandstone was also introduced by the old builders;* and the north transept door seems to be of Caen stone.

One of the ancient Irish Round Towers adjoins the south transept, and is well seen in our engraving. It is 100 ft. high.

The principal measurements of the cathedral, clear of the walls, are as follow:—Nave, 107 ft. by 28 ft. 3 in.; side aisles of ditto, 14 ft. 7 in.; north transept, 38 ft. 10 in. by 28 ft. 11 in.; south transept, 38 ft. 8 in. by 28 ft. 10 in.; choir, 73 ft. 10 in. by 28 ft. 8 in.; choir aisles, 48 ft. 6 in. by 15 ft. 10 in.; lady chapel, 28 ft. 7 in. by 20 ft. 8 in.; area of tower, 26 ft. Total length from east to west, 212 ft. 3 in.; total breadth across transepts, 117 ft.

* In the modern restoration work a very good fawn-coloured fine-grained sandstone from the lowland of Coolcullen, in the Castlecomer coalfield, has been successfully used: it is easily worked, and hardens on exposure to the air.



CATHEDRAL OF ST. CANICE, KILKENNY, IRELAND: AS RESTORED.

RANSOME STONE AND BESSEMER STEEL.

THE Engineers' Society, as already announced in our columns, have paid a visit to the Patent Stone Works of the Ransome Company, and to the Bessemer Steel Works, both situated down on the river-bank, at East Greenwich. The visitors, who were marshalled by Mr. Nursey, the secretary of the society, included Messrs. J. H. Adams, the vice-president of the society, W. MacGeorge, C. J. Light, W. H. Le Feuvre (past president), Baldwin Latham (ditto), J. Bromleys, J. Cargill, A. Williams (hon. sec. and treasurer), and a number of visitors and friends of the society. The first visit was paid to the Ransome Works, where the whole process of artificial stone-making was exhibited and lucidly explained by Mr. Ransome, the managing director. The members of the society were searching in their examination and inquiries, and the sum of their opinions was that the Ransome patent stone (which has often been treated of in our journal) is admirably adapted for building, and especially for ornamental purposes. The visitors then proceeded to the new factory, now in course of erection, for the manufacture of Bessemer steel, and of ordnance made of the material. Mr. Bessemer was in attendance, and explained his process. The retorts were shown in which the ore is fused until it becomes a liquid; then the vessels into which it passes, and where, by the introduction of a powerful blast of oxygen, the silica is separated from the metal, and the latter is transformed into pure steel; and finally the finishing processes, by means of which the material is turned into railway rails, guns, and various other articles. From the interesting conversation that arose, it was gathered that Bessemer steel and Bessemer ingenuity have greater triumphs still in store than any that have as yet been achieved. We are to have a Bessemer steel gun, which will solve the problem that may be said to have foiled the "Woolwich Infant,"—namely, that of discharging a shot proportioned to its size without ultimately destroying the gun. By his method he expects to make the discharge of shot or shell of five tons weight a matter of easy and every-day occurrence. Another of Mr. Bessemer's novelties discussed during the visit to his works was the Channel packet-boat projected by him, in conjunction with Mr. Fowler, C.E., in which an oscillating cabin, like a water-bed, is always to keep its level, and which is to perform the voyage from Dover to Calais in sixty minutes.

"A BRIDGE OF EASE."

So Mr. H. W. Tuson entitles the suspended footway he proposes should be formed over crowded thoroughfares. The rough sketch which he has submitted to the Commissioners of Sewers and other bodies shows his plan as applied to King William-street, London Bridge, and the South Eastern Railway Terminus. The proposed footway and its supports are to be constructed of iron, of a light construction. The estimated cost is about 40,000*l*.

The idea, as our readers know perfectly well, is an old one. The only novelty or usefulness there could be about it would be in the mode of carrying it out; but, as Mr. Tuson evidently knows nothing whatever of engineering, the proposal, we are sorry to have it to say, is altogether valueless.

EXTENSION OF THE EDINBURGH GASWORKS.

THE extension of the Edinburgh Gasworks on ground cleared in Shoemakers' Close is proceeding apace. In a line with the chimney column southwards towards the Canongate, a range of stores for the stowage of gas coal is being erected. The stores are 200 ft. in length, and consist of an iron roof pitched on iron piers connected by girders, leaving both sides open. When completed the stores will be capable of holding 14,000 tons of coal, and this will increase the stowage room within the works to 25,000 tons. Eastward of this range of stores are being built a double row of ovens,—twenty-five on each side. These ovens are of fire-brick, and in each oven there will be five retorts of the newest and most improved description. The ovens will be covered by iron-roofed shedding of a similar description to that of the stores, and will extend a length of 206 ft. When in full operation the 250 new retorts will enable the company to manufacture 1,348,000 feet of gas per day, in addition to the 2,500,000 feet which are made by the existing works. The whole of the new works are expected to be finished before winter sets in. Messrs. J. & R. Park are the contractors for the building work, and Messrs. Tod, Leith-walk, for the ironwork.

The long range of old, tumble-down buildings called Shoemakers' Close, lying between the column of the works and the Canongate, were acquired by the company some time in the beginning of this year. In their demolition some curious knowledge was gained of this part of old Edinburgh. The houses, which must have been between two and three hundred years old, were built on the site of an ancient tannery; and Shoemakers' Close was erected on forced earth. Cuttings laid bare the old tan-pits, and the wood with which they had been lined was quite fresh, although it must have been embedded in the earth for hundreds of years.

THE METROPOLITAN BUILDING TRADES MOVEMENT.

ALTHOUGH the dispute has terminated, it will be some days yet before matters go on smoothly. On Saturday last the central committee of carpenters were fully occupied in attending to numerous applications from small building firms unconnected with the Masters' Association, as to the terms upon which their men would be allowed to work in the future, and to deputations from the men in several other firms, who attended to report that, on application being made to their employers to ascertain whether they intended to work their shops under the terms of the new agreement, they were met with evasive replies in several cases, and in others by a distinct refusal, and wishing to know from the committee how they were to act. To the application from the masters the committee replied that an official printed copy of the agreement between the employers and workmen, with the interpretation of that agreement by the committee, would be forwarded to them through the post, and that they would be expected to comply with those terms. The reply given to the men was that the committee had no power to instruct them upon the matter, but that all firms declining to carry out the terms of settlement would be reported to the delegate meeting on Thursday evening, who would deal with each case upon its merits. They were also informed that it was highly probable the delegates would call out the men from those firms refusing to carry out the agreement. It was reported to the committee that several of the firms who had taken no part in the lock-out had notified to their workmen at pay-time on Saturday that they would commence working under the new arrangements upon Monday of this week.

The following is a copy of the printed document posted on Saturday evening by the central committee of carpenters to every building firm, large and small, throughout the metropolitan district:—

"2, Westminster Chambers, Aug 27.

The working-hours to be 52½ hours all the year round for joiners in shops, and 52½ hours per week for 40 weeks in summer, and 48 hours per week in winter, for out-door works, leaving at one o'clock on Saturday during the winter weeks. The wages to be 8½d. per hour all the year round. Overtime beyond the above hours, when worked at the request of the employer, to be paid for at the following rate: for the first hour at 9½d. per hour, and from the end of the first extra hour until eight o'clock p.m. at the rate of 10½d. per hour; after eight o'clock, at the rate of 1s. 0½d. per hour. This scale not to apply in the case of men working overtime at their own request, or to make up time lost by them during the week. Extra time on Saturdays to be paid for at the rate of time and a quarter up to five o'clock, and after that time at the rate of time and a half. Moved by Mr. Hannen, seconded by Mr. Matkin, and carried unanimously—'That in the opinion of the sub-committee of the Master Builders' Association, and the deputation of the carpenters and joiners, now met together, it is desirable that an endeavour should be made to settle all future questions which may arise on trade matters by conference, or by arbitration.'

On behalf of the employers,
BENJAMIN HANNEN, Chairman.
On behalf of the workmen,
C. MATKIN, Secretary."

As regards the bricklayers' deputation, they returned to the masters' committee with more power to settle the matter, and after several hours' talk, they accepted the terms concluded with the other branches, and succeeded in getting tacked on to them some additional provisions which custom had already sanctioned. The agreement or memorandum runs thus:—

"2, Westminster-chambers, 30th August, 1872.

At a conference between the Sub-Committee of the Master Builders' Association and a deputation from the Operative Bricklayers' Society, the following arrangements have been agreed to:—

The working hours to be 52½ for forty weeks in summer, and 48 hours per week for twelve weeks in winter, leaving off at 1 o'clock on Saturday in the winter weeks. The wages to be 8½d. per hour all the year round. Overtime beyond the above hours when worked at the request of the employer, to be paid for at the following rates, viz.:—for the first hour one penny extra; from the end of the first extra hour up to 8 p.m., at the rate of two-pence extra; after these hours at the rate of time and a half. The extra time on Saturday to be paid for at the rate of time and a quarter up to 5 o'clock, and after that hour at the rate of time and a half. This scale not to apply to the case of men working overtime at their own request, or to make up for time lost by them during the week. Half an hour for breakfast and half an hour for dinner to be allowed during the winter weeks. Gauged work, when executed as day work, shall be paid for at the rate of a penny an hour extra. Bricklayers sent from London at the request of the employer to country jobs to receive London wages, with an additional allowance for lodgings, the railway fare to be paid to the job, and if discharged by the employer the fare back to London.—(Signed), B. Hannen, C. W. Jackson, J. M. Macey, W. Brass, Stanley G. Bird (hon. secretary), E. Coulson, J. Batchelor, H. Honur, W. Crawly, J. Paget, G. Knapp."

The Executive Council of the London General Labourers' Union have addressed the following notification to the builders' labourers of the metropolis:—

"Brothers,—We wish to inform you that our delegate, Mr. Kenny, got the following terms from the Master Builders' Association for all labourers (shops as well as jobs):—One halfpenny rise: those who had 4½d. will have 5d.; those who had 4¾d. will have 5¼d.; those who had 5d. will have 5½d. Overtime: First hour, one halfpenny extra; the following two hours, penny extra per hour; after eight o'clock at night, time and a half. If you work after twelve on Saturday, time and a quarter till five o'clock; after five, time and a half. In our memorial we ask for sixpence per hour, which is little enough for our labour. If you think so, unite at once with us; if you do not, you will have to take for your labour the buyer's price, and not your own. The above agreement, signed on behalf of the masters, comes into operation on September 2nd."

THREATENED INJURIES AT STIRLING.

SIR,—Should your attention not already have been called to the threatened destruction, or, at least, disfigurement, of the Castle Rocks at Stirling, will you kindly devote a corner of your valuable space to expose the iniquity and barbarism of the whole affair? It appears that the town council of that burgh have actually disposed of a considerable portion of this beautiful and classic rock,—one of those rare, isolated, and igneous basaltic protrusions on which the royal Castles of Edinburgh, Stirling, and Dumbarton are so picturesquely perched,—for the base purpose of quarrying it for road-metal! Shade of King Robert the Bruce! where has our national sentiment of patriotism gone to? What would Sir Walter Scott have said on hearing of the destruction of his darling "Grey Bulwark of the North"? Here is what he did say on one memorable occasion respecting a similar act of vandalism (the destruction of the Cross in the High-street of Edinburgh):—

"Oh, be his tomb like lead to lead
Upon its dull destroyer's head;
A minstrel's malison is said!"

Pray let us have a little anathema from the *Builder*.

ALPHA.

NOTES IN THE BROMPTON CEMETERY.

MR. DILLON CROKER, continuing his sketches in the *South London Press*, gives an interesting account of the West London Cemetery, which extends from the Fulham-road to the Richmond-road, and was consecrated in 1840. We condense some of his remarks. Some years ago, says Mr. Croker, it was proposed that the Government should become the owners of the various cemeteries around London, and a Bill was prepared for the purpose, no doubt being entertained but that it would pass through Parliament without opposition. An agreement was in the interim made with the West London and Westminster Company for purchase. The Bill, however, was thrown out, but the agreement was insisted upon by the company, and we are given to understand that this cemetery is now Government property.* Here T. P. Cooke and Walter Montgomery lie side by side, on the path right of the catacombs, close to one of the bell towers. We read on Mr. Cooke's monument that he served under Nelson, and was present in his Majesty's ship *Raven* at the battle of St. Vincent; then follows a fitting tribute to his able delineations of the character of the British seaman. About half way down on the right of the centre avenue is the handsome monument, 24 ft. high, erected by public subscription to the genial

* Quite correct. It was valued for the Government by the late Mr. J. W. Higgins, Mr. Lockyer, and Mr. G. Godwin.—ED.

and gifted Alfred Mellon (sometimes styled the English Costa), who died at the early age of forty-seven, mourned by all who knew his many endearing qualities.

Separated by one grave, we find that of Alfred Mellon's niece, Nelly Moore, who will be long remembered as a charming *ingenue*, whose death, when only twenty-four years of age, saddened the whole of the theatrical world, and a number of private friends, by whom she was dearly loved and respected for her gentle nature.

Immediately behind will be found the memorial cross which Mr. C. Millward caused to be erected at his own expense, "in affectionate remembrance," over the grave of Joseph Henry Irving, the comedian, whose performance of "Uriah Heep" was so full of promise, and whose career ceased when he was only thirty years of age. Near these graves are those of the graceful and gentlemanly Leigh Murray, and J. H. Tully, the conductor of the orchestra at Drury Lane for many years. On the other side of the avenue we come upon the grave of the father of Albert Smith. Here are also buried Mr. and Mrs. Albert Smith, and Arthur, the brother of the former. Close to the hideous monument of John Jackson, the professor of sparring, will be discovered the grave of Charles Godfrey, bandmaster of the Coldstream Guards, the father of the now celebrated Dan and Charles Godfrey.

In this direction is the resting-place of James Rogers, the comedian, who died on April 15, 1863, aged forty, and which has the following inscription:—

"You have heard—some know—the story of his life,
That brief existence with afflictions rife;
How to the last he struggled with the foe,
Whose shadow darker nightly seemed to grow,
Still smiling through his sufferings, and though wrung,
By quivering pain, a jest still on his tongue.
He had cause indeed to wish the play had power
To 'ease the anguish of the torturing hour.'
Shall it be said, the man who bravely fought
Life's battle out, no noble lesson taught?
No! 'twas a hero's sermon for the age,
Preached from the player's pulpit of the stage,
Remembered by us."

Nearer the Fulham-road entrance are the graves, next to each other, of Robert Keeley and Frank Matthews; not far off is also that of Edward Wright. What agreeable memories do these three names recall! If one of the most pleasant of humanities be to laugh, well may we hold them in grateful remembrance. The tomb of Sir Roderick and Lady Murchison will be seen in the centre path, where a handsome but rather too pretentious marble mausoleum, with a figure of "Hope" at the top, has been recently erected by a Mr. Henry France, of Wardour-street, to the memory of his wife, which must have cost a very large sum indeed. The coffin is seen through the opening, and at the back is a window of stained glass. Amongst others may be mentioned the graves of H. F. Chorley, the acute musical critic; Sir S. Cunard; Pettigrew; F. W. Fairholt; R. B. Peake, the dramatist; Mr. and Mrs. Tayleure, actors; Sotheby, the well-known auctioneer, author of several learned works, the most remarkable of which is his "Principia Typographica;" Captain Harrison, a distinguished member of one of the first yacht clubs; Robert Gunter; Francis Nicholson, the landscape-painter, one of the founders of the old Water-Colour Society, who died when at the patriarchal age of 91; and his son-in-law and daughter, Mr. and Mrs. Crofton Croker, whose deaths occurred within two months of each other,—the first on the 8th of August, and the second on the 6th of October, 1854. Here is also the grave of Sydney, Lady Morgan, upon which rests an effigy of an Irish harp, above which are two volumes, inscribed "Wild Irish Girl" and "France."

THE NEW CHURCH OF FATHER IGNATIUS'S MONASTERY, IN THE WILDS OF WALES.

THE foundation-stone of a new church has been laid by the Rev. Father Ignatius, at the Monastery of St. Mary and St. Dunstan, Llanthony. After leaving the ruins of the old priory, a drive of four miles along a rough and dangerous road brings the visitor to the monastery, at which the superior of the English order of Benedictine monks, with eight or ten of the brethren, have taken up their sequestered abode. The monastery is situated on the slope of a bleak and hoary mountain, commanding a view of the sequestered valley of the Ewias. In these solitudes Father Ignatius has reared the germ of what is intended to be developed into an extensive monastic institution, one wing only of which is at present built. The structure, when completed, will bear an exact resemblance to the old Abbey of Llanthony, the length of which, from west to east, is 212 ft., and the breadth, including the aisles, 50 ft. The length of the transept from north to south is 100 ft. The new monastery was commenced about three years ago, by two brothers, who had previously been living in a hut on the mountain, subjecting themselves to great inconvenience, and even privation, in the winter. The land was given by a lady "associate." The choir and nave of the new church (the portions now commenced) will be erected at a cost of about 3,500*l.*, the whole sum being given by an English Churchman. The architect is Mr. C. Buckridge, of London and Oxford. These are odd times in which we live!

ECONOMY IN FUEL:—THE "BUILDER" FIRE.

A CORRESPONDENT of the *Times* describes what has for so many years been well and widely known as "The *Builder* Fire," but whose paternity, like that of many other good things, has been lost in the lapse of years. With this correspondent's description of our celebrated fire we may refresh the memory of our old readers, and instruct the new at the present juncture:—

"The plan advised is the insertion of an iron plate ½ in. in thickness, closely fitted upon the bottom grating of the stove, leaving the space between it and the front bottom bar open as it is at present. The fire should be made by being well packed with small lumps of coal about half-way up. The wood should then be placed, then an upper layer of coal, and then lighted. By this means the upper layer of coal becomes speedily ignited, and a good fire is soon obtained; and as the air cannot pass upwards through the bottom, the fire will gradually burn downwards, not only taking a considerable time to do so, but effectually retaining every particle of fuel, which cannot fall through."

This fire will last for many hours without any fresh supply being required, and will give out a much larger volume of heat than an ordinary fire. By this means small coal, and even dust, may be as readily used as large, while the saving in consumption, as the *Times* correspondent says he has long proved, is quite 50 per cent. in all stoves except the kitchen range, which is, no doubt, capable of considerable improvement; while, in addition to the saving of fuel, the result is greater cleanliness and comfort, more heat, and less necessity to attend and replenish the fire. The use of the poker is almost entirely superseded, it being only necessary once during the day to thoroughly press the fire together, and being replenished, it will burn till night. In very small grates this plan will not perhaps succeed. A small surface of fire will not obtain sufficient air through the front bars to support combustion; but in all of a moderate size it may be used with the advantages enumerated.

THE "NATIONAL SCHOOL-BOARD DESK."

SIR,—In noticing, in your last issue, a new desk, with the above title, by Mr. Moss, for seating children in pairs, which is certainly ingenious, you very rightly conclude that "the question of space will probably arise." There is, it appears to me, a practical objection to its general use in national schools which the inventor has not taken into consideration,—viz., its *inconvertibility* into the various uses for which school-desks are now generally called into play. Under the name of "convertible," a bench with desk, variable in length, is now pretty generally adopted, which, as well as doing duty for school purposes, can be used as a table for school teas and treats, or as a bench, with sloping back, arranged for lectures, concerts, &c. Mr. Moss's desk in pairs seems to offer none of these advantages.

FREDK. R. WILSON.

THE SPEAKER AND HIS FARM LABOURING PARTNERS.

THE Right Hon. the Speaker has given his annual treat to the labourers on the Glynde estate, to celebrate the in-gathering of the harvest. He presided at the dinner, and in the course of his remarks said:—

"I will make a proposition to you, and to all in my employ. If you have got 5*l.*, we will say, in the savings-bank, and you would like to lend that to my farming business, I will engage to give you, as the savings-bank does, 2½ per cent. for the money. And I will do more than that. I will, supposing the profits of the farm amount to more than 2½ per cent. for the money I have invested, give you rateably precisely the same interest upon the capital you lend me. That is to say, supposing I get 10 per cent. as profit on the capital I have invested on the farm, you shall have 10 per cent. on your 5*l.* instead of 2½. So you will see, you will be in this position, that you will never get less than the 2½ per cent. you receive at present, and if the farm yields more you shall have the benefit of it. Carters, shepherds, &c., for instance, receive about 15*s.* per week, and out of this it seems to me to be by no means impossible that some may save 2*s.* a week; and if you pay me that sum I will engage at the end of the year to pay you the 5*l.* if you desire it, plus 2½ per cent., or whatever rate of interest arises from the year's farming operations. I am quite sure of this, that we shall never come to a satisfactory settlement of the relations between employer and employed until the latter, according to the amount of labour and capital he has invested, has an interest in the good conduct of the concern."

His sole object, as he stated, was to give his farm labourers a personal pecuniary interest in the conduct of the farm, and to endeavour to raise them a little above the position they now occupied as labourers.

THE THAMES CONSERVATORS AND THE CHELSEA VESTRY.

AT the Chelsea Vestry, a letter was read from Mr. Payne referring to a statement in the *Builder* relative to the Thames Conservators and the endeavour of the Vestry to obtain a jetty. In his letter, Mr. Payne said he considered the parish had been most unfairly treated by the Thames Conservators and the Metropolitan Board, and the mode of transit by water which the parish had enjoyed for hundreds of years was taken away, and nothing given in return. The embankment had ruined the river from the Swan at Chelsea to the old church. The river ought to be widened on the opposite side. This letter was considered in connexion with Mr. Marr's offer of accommodation at the jetty at Cremorne, but no action was taken.

ASPHALTE IN CHELSEA.

THE Chelsea Vestry having proposed to lay down asphalte in the parish as an experiment, and either pay for the same at the end of twelve months, or require the asphalte company to take the asphalte up, the following companies sent their terms in:—Val De Travers will lay 2 in. of asphalte on 6 in. Portland cement concrete at 12*s.* per yard super., and remove it and reinstate the roadway at the end of twelve months, should the asphalte prove a failure. If it succeeds the company will require 5 per cent. interest, provided the asphalte is in as good a condition as when first laid down (fair and reasonable wear and tear excepted). The Limmer Asphalte Company offer to lay down 2 in. of asphalte on a concrete foundation, and keep it in repair for two years, at 12*s.* 6*d.* per yard super. The vestry are to get the road ready for the concrete, and to pay 60 per cent. of the charge within a month after the completion of the work, 30 per cent. at the end of three months, and 10 per cent. at the end of two years. The Barnett's Patent Asphalte Company offer to lay down 2 in. of asphalte on 6 in. of Portland cement concrete at 12*s.* the square yard.

The vestry, after some discussion, decided that as none of the companies had complied with the conditions of the vestry's proposal, they could not entertain their terms, and that the companies be so informed.

BITUMINOUS BUILDING, PAVING, AND GENERAL CONSTRUCTION.

A NEW company has been set agoing, with a capital of 100,000*l.* in shares of 5*l.* each, from the prospectus of which, recently issued, we extract the following particulars.

Mr. McCullagh Torrens, M.P., is the chairman. Mr. J. L. Norton, whose patents are to be appropriated, will be the managing director for two years; and the consulting architect is Mr. Edward Norton Clifton, of London. The temporary offices are at No. 8, Old Jewry.

"The recent successful employment of bitumen in the formation of street paving has been generally looked upon as the only method in which asphalte can be rendered serviceable. That this notion, however, is erroneous, may be shown by reference to the manifold uses to which asphalte was applied by the ancients: the existing ruins of their buildings evidencing the important position which it occupied as a constructive material from the time of the Assyrians and ancient Egyptians down to that of the Romans. To this subject Mr. J. L. Norton, the well-known patentee of the tube-wells used in the Abyssinian expedition, has for some time past devoted his attention, and has succeeded in inventing and perfecting a system of employing bitumen, which, in the opinion of practical men, and as tested by experience, must lead to great changes and improvements in building and construction generally.

The various materials used in the patent process have stood the test of years, and their application and adaptation for the purposes intended may be gathered from the following summary:—

'*Bricks.*—These may be made in any locality, and need neither weathering, pugging, drying, nor burning. They

are, moreover, of extraordinary durability, impervious to moisture, unaffected by frost or thaw, and ready for use within a few hours' time.

Building.—*Foundations* and *basement-floors* are made both water and damp proof. Bricks can be laid at the rate of 3,000 to 4,000 daily per man, as compared with 700 or 800 under the present system. *Ceilings* and the *inner sides of walls* can be prepared in a dry state. *Roofing*, while rendered thoroughly water-tight, requires only half the number of slates as compared with the present system. *Ornamental tiling, woodwork*, and other decorations can be carried out in a much more effective, expeditious, and less expensive manner than hitherto.

Paving.—Roadways will possess greater durability, and be at the same time as clean and noiseless as the asphalte roadways now in use; while horses will have as good a footing as on macadamised roads, both on levels and inclines, a desideratum not hitherto accomplished, and removing the great objection to asphalte as at present used. Tramways can be laid down at a reduced cost and with increased facilities for construction and maintenance. Stables thus paved will save not only 60 to 70 per cent. of the straw usually employed, but will greatly increase the value of the manure, as shown by the accompanying memoranda.

General Construction.—Reservoirs, tanks, arches, basement floors, embankments, sea-walls, &c., may be made at a very large saving in cost of material, labour, and time, their soundness and durability being unquestionable.'

The operations of the company are intended to be carried on by the establishment of a manufactory in the neighbourhood of London for the preparation and sale of the patent construction materials. The actual work of construction will also be undertaken by the company to an extent sufficient to fully occupy its available capital; and licences will be granted to builders, contractors, and others, to avail themselves of the patent processes.

A house built by Mr. Norton, on his patent system, may be seen at his private residence, Perry Hill, Worplesdon, near Guildford; and various specimens of the paving are laid down in the New Inn-yard, Old Bailey, where they have been subjected to most severe tests.

As regards the supply of bitumen, a contract has been entered into for the purchase of an estate of 90 acres of land in Sicily, containing enormous deposits of rich asphalte rock."

Mr. Wyatt Papworth, architect, has reported favourably on Mr. Norton's systems of construction.

COVENT GARDEN THEATRE.

ADMITTING that Mr. Boucicault's magniloquent announcement of the re-opening of Covent Garden as the National Theatre turns out to be a mistake, and that "Babil and Bijou" is after all but a fairy extravaganza, differing only in degree from many others, he has nevertheless produced, in conjunction with Mr. Planché, who has contributed a number of most charming lyrics, a very remarkable work of its kind, which for some time to come will serve to delight the large audiences the theatre has been fitted to receive. The first two acts are a little tame, and might be greatly improved if the whole of the actors were re-drilled, and Mr. Lionel Brough would exhibit a little more of his usual vivacity and force. "The River of Life" is an excellent idea; the ballet is beautiful (though the changes in the scene might be more effectively managed), and the whole culminates in a spectacular display which leaves the spectators no wits for criticism. Three composers have co-operated in the provision of original music, two or three of the pieces being very charming, notably the boys' invocation to spring,

> "Spring! Spring! gentle Spring!
> Youngest season of the year,"

which nightly takes the house by storm, and will soon be sung in every part of the country where a vocal association exists. Wealth, skill, and taste have been lavished, and the result is a great success.

WEST HAM SEWERAGE.

SIR,—Mr. Lewis Angell, the surveyor at West Ham, has represented to the public, through the *Builder*, that great injury has been inflicted on the ratepayers by the refusal of the Local Government Board to sanction the proposed outlay of about 100*l.* per acre on upwards of 700 acres of land to be used for sewage irrigation, with 30,000*l.* added for works. As this land only sells for about 70*l.* per acre, when put up in the open market, the ratepayers appear to have had good ground for objecting to the preliminary negotiations. Why Mr. Angell should have been angry because his arrangements were not approved he knows best.

The Local Government Board rejected the scheme on financial grounds, and not on the question of sewage irrigation. The proposed scheme would have been ruinously costly to the locality, and clarification of the sewage may serve at West Ham. The following has been forwarded to the Inspectors. SANITARIAN.

"August 27th, 1872.

SIR,—I am instructed by the Committee of the West Ham Ratepayers' Association to forward to you the following resolution, carried unanimously by them at their last meeting:—

'That the best thanks of the Association are due, and are hereby tendered, to Mr. Rawlinson and Mr. Harrison, for their thorough and patient investigation into and hearing of the evidence respecting the West Ham Sewage Farm; also for their wise decision in relation to the same.'

And to add,—

'That in their opinion the wisdom of such decision is further strengthened from the fact that a portion of the said farm was sold, on the 25th of July last, for more than 30*l.* less per acre than the parish was about to give as the declared market value.'—Vide *Essex Times* of the 27th ult. (Signed) GEO. COOK.

Buxton-road."

THE DRAINAGE AT WINDSOR CASTLE.

THE works now in progress for the drainage of Windsor Castle and Frogmore House are being pushed forward. The sewage, which is to be separated from the rainfall, will be conveyed from the Castle, the buildings in the Home Park, and Frogmore House, through earthenware pipes, 9 in., 12 in., and 15 in. in diameter, to a receptacle at the Royal Dairy, Frogmore; thence it will be taken through the main pipe, 18 in. in diameter, for about a mile across the Home Park and Manor Farm, in an easterly direction, to the pumping station, which has been built near the old wooden one over the navigation cut at Old Windsor. Owing to the large amount of water used at the castle the sewage upon reaching the pumping station will be in a very liquid condition. It will here be received in the straining chamber, which is 10 ft. by 7 ft., and then pumped through an iron pipe laid across the new bridge now in course of erection, and which will replace the old wooden structure, to the irrigation plot, a field of about fifteen acres, situated upon the Ham, at Old Windsor. The pumping apparatus will consist of a compressed-air engine of from 2 to 4 horse power, placed near the station; and it is expected that pumping for ten hours a day will dispose of twenty-hours' sewage from the Castle, Frogmore, and the Home Park, and pass it across the cut to the pipes on the Ham. These pipes will be furnished with openings about five yards apart for the purpose of irrigating the farm.

CHURCH-BUILDING NEWS.

Sheffield.—St. Marie's Church, Norfolk-row, has been re-opened, after being cleansed and painted by Mr. Robinson, of Broomhill, under the directions and superintendence of Messrs. M. E. Hadfield & Son, the architects. Advantage has been taken of the occasion to erect a reredos in St. Joseph's chapel, in memory of the late Miss Smilter, of Richmond, the entire expense of which has been defrayed by a friend of that lady. The reredos consists of canopied niches, carved, with arcading at the sides, in Caen stone. The architecture is of the early part of the fourteenth century. It has been executed from the design of Mr. Charles Hadfield, by Mr. Earp, of London. The relievo and figures are from the studio of Mr. Phyffers, who is a Belgian artist, though now residing in London. The centre niche, the only one at present filled, represents in relievo the death of St. Joseph; and in the sides are to be placed figures of angels holding musical instruments, and in the centre below a figure of St. Joseph. Above the reredos are two new stained windows, by Lavers, Barraud, & Westlake, of London.

Bristol.—The chief stone has been laid of a new church, to be called St. Andrew's the Less, upon the site of the old church in Dowry-square, Hotwells, which has been pulled down. As the plot of ground is in the line of a row of buildings, the sides of the church will not be visible. The principal frontage is in Dowry-square, and the back is in Green-street. The structure, the foundations of which have already been put in, is to be of Brandon-hill stone, with free-stone dressings. The style is of the thirteenth century. The church is to consist of a nave, aisles, and chancel. In consequence of the eastern and western ends being blocked with the walls of the adjoining houses, the only means of light to be obtained is from windows in the north and south sides. The church is divided into four bays, three of which will form the nave proper, and the fourth the chancel. The chancel opens into a quasi-transept, built upon the old burial-ground, and that towards Dowry-square forms the vestry and organ-chamber. There is to be a tower at the south-west corner, with a slate spire, the total height of which will be between 90 ft. and 100 ft. At the side of the tower is a staircase leading to a gallery at the west end. The internal columns throughout the church are to be of blue Pennant, with carved capitals. The church is to seat 460 persons, and the whole of the sittings are to be free. The sacrarium and chancel are to be paved with Godwin's encaustic tiles, and the body of the church with Staffordshire tiles. The architect is Mr. J. C. Neale, and the builder Mr. R. J. Crocker, of Bedminster. The total cost of the building will be about 2,000*l.*

Ivinghoe.—The church of Ivinghoe, in the archdeaconry of Buckingham, has recently been opened, after a restoration by the diocesan architect, Mr. G. E. Street. The church stands at the foot of the Chiltern hills, a little eastwards of the London and North-Western line of railway between Cheddington and Tring. It is a cruciform building with central tower. The piers and arches of the tower and nave are of the thirteenth century, and the remains of the Early English building are also discoverable in the transepts and other parts of the edifice. The church was encumbered with high pews, and with a formidable western gallery, and the fabric generally greatly needed the hand of the restorer. The renovation, so far as it goes (the exterior still needing restoration), is what might be expected from the able architect.

Barton Moor Lane (near Manchester).—Emmanuel Church was re-opened by the Bishop of Manchester, on Saturday last, after undergoing alterations, comprising the addition of a chancel aisle and south transept, enlargement of vestry, erection of an entrance at the west end, and the entire removal of the south porch. The west gallery has been taken down, and the lower part of the tower, situated at the west end of the south aisle, and which formed the entrance to the gallery, is now converted into a baptistery. Stained glass has been put in the west window, by Hardman, of Birmingham. The inner vestibule is formed by a traceried screen of pitch-pine, glazed with cathedral plate, in geometrical lead lights. The original accommodation was for about 500, which is now increased to 650, 280 of which are free. The church is in the Decorated style of architecture, and built as recently as 1858. Messrs. Horton & Bridgford, of Manchester, were the architects, and Mr. Cardwell, of Altrincham, was the contractor.

DISSENTING CHURCH-BUILDING NEWS.

Southsea (Hants).—The Congregational Church for the new district in the Dover-road has been completed, and dedicated. It is built in the Early Decorated period, and consists of nave, apse, east and west transepts, and aisles. The foundations are also put in for the tower in the north-west angle. The extreme length is 92 *ft.*; width, 62 ft.; height to ridge, 54 ft. The pewing is of pitch pine, and fitted to accommodate about 650 persons, with standing room for about 150 others. A school-room was first erected in the rear of the site, and worship has been conducted therein during the erection of the church. Mr. Stent, of Warminster, Wilts, was the architect; and Mr. Smith, Portsea, the builder. The heating was done by Messrs. Haden & Son, of Trowbridge; and Mr. Barnden was the clerk of the works to the whole.

London.—The foundation-stone of the new Welsh Congregational Chapel, to be erected on the site of the old one in Southwark Bridge-road, has been laid by Mr. Samuel Morley, M.P. The total cost of the chapel is to be about 5,000*l.*, of which 3,000*l.* go to purchase the site. Mr. Thomas, of Swansea, is the architect; and Mr. Gough, of Chelsea, the builder.

Hornsea (Yorkshire).—The foundation stone of a new Congregational Church has been laid here by Mr. E. Crossley, of Halifax. The plan shows the building to be entered by a porch and tower entrances, leading into a vestibule, from which access is obtained to the ground floor of the building, which consists of a nave and two shallow transepts, affording accommodation for 410 people; and with a small west gallery the building will contain sixty persons more. At the rear of the church, and opening from it, is placed the schoolroom, contiguous to which, and having an entrance into the church, is the minister's vestry. The church will be provided

with open seats having solid ends, and will be covered by an open-timbered roof, which (with all internal woodwork) will be lightly stained and varnished. The tower is to be placed on the south-west angle of the building, and to be surmounted by an octagonal spire in brickwork, to rise to a height of 91 ft. It is intended to place in the tower a clock and bell. The building is to be erected in bricks, and faced with white stocks, relieved by bands and arches of red stocks, and will have Yorkshire stone dressings to windows, &c. The glazing will be in cathedral glass in quarry pattern. The building will be in an early style of Gothic architecture, and erected by Messrs. Hulse & Stephenson, bricklayers; Messrs. H. & W. K. Barr, joiners; Mr. John Denton, mason; Mr. James Barr, plumber, glazier, gasfitter, and painter,—all of Hornsea; and Messrs. King & Co., and Dawber, of Hull, are contractors for the ironwork and slating respectively. The building is from the designs, and to be carried out under the superintendence, of Mr. Musgrave, of Hull.

Faversham.—The memorial stone of the new Baptist chapel now in course of erection at the bottom of St. Mary's-road has been laid by the Rev. C. H. Spurgeon. The building is to be 60 ft. by 37 ft., and is intended to afford accommodation for about 400 persons. The total cost will be about 1,800*l.*

Manchester.—The foundation stone of a new Congregational Church, to be erected in Broughton Park, has been laid. The site is near to Broughton Hall, and surrounded by three roads. The church will be in the Decorated style. It will consist of nave and side aisles, with transepts, the north aisle being terminated by a tower and spire, rising to the height of 175 ft. At the east end of the church there will be a lecture-room affording accommodation for 200 persons. There are to be vestries for ministers and deacons, with rooms appropriated for ladies. Accommodation will be provided in the church for 600. Separating the lecture-room from the church a Gothic screen, in the shape of an open Gothic window, is designed, and, as occasion may require, it can be so arranged as to convert the lecture-room into a part of the church proper during divine service. Ample provision has been made in connexion with the lecture-room for the requirements of social gatherings. Mr. S. W. Daukes, of London, is the architect. The arrangements for the building are not yet completed, no tender having been accepted, but it is expected that the cost will amount to about 12,000*l.*

Kenilworth.—The foundation-stone of a new Independent chapel, at Abbey-hill, Kenilworth, has been laid by Mr. Alfred Keep, of Edgbarton, Birmingham. The chapel is to be built of brick, with Bath stone dressings and windows, from the designs of Messrs. G. & J. Steane, of Coventry, architects. The style is Gothic: the length about 70 ft., and width 31 ft. 6 in. The cost will be about 1,600*l.* The chapel is to hold 300 persons in the body, and 100 boys in the gallery. The builder is Mr. J. B. Stanley, of Leamington; and Mr. Jenkins, of Leamington, has the contract for fitting up with hot water.

Middleton-One-Row.—According to the *Darlington Times*, the foundation-stone of a new chapel, for the use of all Christian denominations, has been laid at Middleton-One-Row. The site faces the river, opposite the centre of the village, and has been placed at the disposal of the promoters of the new edifice by Mr. H. A. W. Cocks. The plans have been prepared by Mr. Robinson, of Darlington. From these it appears that the building will be 38 ft. in length by 24 ft. 6 in. in width, and will provide accommodation for about 168 persons. Utility has alone been considered, and not architectural beauty; the building will therefore be comparatively plain. It will be constructed of red brick, and faced with stone. The cost is estimated at between 400*l.* and 500*l.*

SCHOOL-BUILDING NEWS.

Whitworth (*near Rochdale*). — The corner-stone of this school, which is to be used for day and Sunday purposes, has just been laid. The building will be of Parpoint stone, with Yorkshire stone dressings. A method is adopted of utilising the whole of the class-rooms when required for public meeting purposes. The cost of the building will be about 2,200*l.* The architects are Messrs. Maxwell & Tuke, of Bury.

Wolverhampton.—St. John's Schools are now being enlarged by the addition of a room to accommodate about 170 infants, with class-room attached. The building is one story high, of a plain description. The tender of Messrs. G. & F. Higham at 368*l.* including galleries, &c., was accepted, and the works are being carried out from the designs and under the superintendence of Mr. J. R. Veall, architect.

Halifax.—The foundation stone of the new Sunday School in connexion with the Harrison-road Congregational Chapel in this town has been laid by Mr. John Crossley, of Hopwood Hall. The site selected for the school is that portion of ground formerly known as Cadney's Croft, on the lower side of the chapel, and on which many circus proprietors have often pitched their tents on flying visits. But now the whole site is being filled up with dwelling-houses, and a considerable portion of it will be occupied by the new school. The contractors are—For the masonry, Mr. J. W. Wilson; joinery and carpentry, Mr. H. Dearden; slating and plastering, Messrs. Taylor & Firth; plumbing, Mr. Joseph Barker; hot-water apparatus, Mr. E. Lumby, all of Halifax.

Northampton. — New Roman Catholic poor schools for girls and infants, erected on the Lower Mounts, in connexion with the Convent of Notre Dame, Abington-street, have been opened here. The building is a two-storied one, its elevation from basement to ridge being nearly 40 ft. It is a plain red-brick erection, but is relieved with white brick and stone ornamentation for window arches and sills. The front entrance is also arched in stone, and it is intended to add a little further ornamentation at this point by placing a figure of the Virgin and Child under a canopy. The room on the ground floor is to be used for infants, and is fitted with a gallery; and that on the upper story for girls. Both schools have class-rooms adjoining; they are also provided with lavatories, and other requisite conveniences. The dimensions of the two principal rooms are:—On the surface floors, 49 ft. by 22 ft.; height of lower, 14 ft., and of upper, about 18 ft.; class-rooms (infants'), 22 ft. by 12 ft., and girls', 22 ft. by 19 ft. The rooms will afford accommodation for about 300 children. Mr. Hull was the architect; and Mr. Watkin, whose contract of 910*l.* was the accepted one, was the builder.

Stoke Prior.—New schools, erected by Mr. Corbett, of the large salt-manufactories, have been opened here. The building is to serve as schoolroom for the children of his workpeople, a place for holding divine worship on Sundays, and a lecture-room or hall for use when occasion requires. There is also attached a dispensary, in which a supply of medicines and appliances in case of accidents will be constantly kept, the whole to be maintained at the sole cost of Mr. Corbett. The edifice is built from designs by Mr. M. Bohill, and was erected by Mr. Corbett's own workpeople, on a site given by him in Shaw-lane, near to his works. It is of the Gothic order of architecture, and the lecture-room is 90 ft. by 36 ft.; class-room, 36 ft.; infants' school, 26 ft. by 21 ft.; height to the wall-plate, 16 ft.; the roof (an open one, stained and varnished), rising 21 ft. to the ridge, with an ornamental bell-tower in the centre, and a tower over the front porch. The large room can be divided, so as to form two school-rooms. The playground is 180 ft. by 150 ft., and the school will accommodate 500 children, attached to which is a residence for the schoolmaster and schoolmistress. The cost of the building amounts to about 3,500*l.*

Books Received.

Health and Comfort in House Building; or, Ventilation with Warm Air by Self-acting Suction Power. By J. DRYSDALE, M.D., and J. W. HAYWARD, M.D. London: Spon. 1872.

IN a previous volume we printed part of a paper by Dr. Hayward, read at a meeting of the Liverpool Architectural Society, descriptive of a house built by him, with special arrangements for warming and ventilating. The volume now before us is an elaboration of this paper, made in conjunction with Dr. Drysdale, who had previously erected a house in the suburbs of Liverpool, in which he had attempted to meet many of the defects of ordinary houses. The scheme worked on may be said to be, plenty of fresh air admitted to a heating chamber in the lower part of the house, and thence supplied to the various rooms through openings in the cornices;—the collection of the foul air from the various rooms, into a foul-air chamber formed in the roof, whence it is taken down to the kitchen fire, and passed off to the air by an air flue formed round the smoke flue. The due adjustment of the openings for admission and emission, and the prevention of accidental ventilation which would interfere with the results of the calculations, of course come into discussion as difficult portions of the problem to be solved. All the flues, as they are provided for a probable maximum, attained only on extraordinary occasions, must be controllable by valves. The difficulty of "squaring" all the antagonistic circumstances must be great; neverthless the authors state as the result of practical experience, that "in the houses erected in accordance with these data, the whole scheme works with an accuracy quite sufficient for all the requirements of practical utility." In an appendix the various methods of calculating draughts in hot-air flues are reviewed, several formulæ being given, and there is a record of some original experiments performed in one of the houses. The volume will be found of value by those who know how to use it.

A Few Lines on the Hunter, the Charger, and the Roadster. By WOODMAN. London: Sampson Low & Co.

THE writer of this little book is evidently a "horsey" man, in the best acceptation of the word: he is fully impressed with the importance of his subject, and dwells on the good points of a horse with all the affection of a young lover for his mistress. Many persons who drive or work horses know nothing about them, and would be glad to get a little knowledge on the subject, but are deterred by the largeness of the books in which it is treated of. To such we would recommend Woodman's "Few Lines," which will be found a very good introduction.

VARIORUM.

AMONGST reprints of papers and lectures touching the sewage question, we have to mention a paper read before the Philosophical Society of Glasgow, "On the Drainage and Sewage of Towns," by John Phillips, C.E., and the substance of two lectures read before the Literary and Philosophical Society of Nottingham, by M. O. Tarbotton, C.E., entitled, "Sanitary Legislation and Science, with especial regard to Sewage and Water-Supply," both published by E. & F. N. Spon. Mr. Phillips has before now set forth his views in our pages. Nevertheless, we give a *résumé* of the deductions he arrives at in the paper now published:—

"1. That it is expedient that the subsoil of towns should be thoroughly drained and ventilated, so as to render it dry, and the houses erected thereon perfectly free from damp.

2. That it is expedient that the surface water should be collected into channels, with which the subsoil drains should be connected, but from which the sewage drainage should be carefully excluded, so that the water conveyed thereby should be discharged into the natural water-courses or rivers in a practically innocuous condition.

3. That the sewage drainage should be removed in separate channels or pipes of dimensions not larger than necessary for its passage, and should be conveyed to positions outside the towns by gravitation or pumping, and there clarified by chemicals in tanks, and afterwards distributed by irrigation over land made fit for its reception by deep surface pulverisation and deep subsoil drainage, or similarly clarified before permitting it to enter a stream or river.

4. That a system of sanitary police be established, whose duty it should be constantly to collect the horse droppings and surface refuse, which should be removed and deposited upon the land; and, further, to render the street surfaces perfectly clean by continually sweeping them and occasionally washing them.

5. That, with the view of reducing the volume of sewage for irrigation and filtration within manageable limits, it is expedient that the water-supply fittings, and the water supply to closets, should be supervised, in order to prevent leakage and waste, and needless use of water; and that the liquid refuse in factories should be purified in tanks on the factory premises, and then discharged with the rain and subsoil water into the streams and rivers.

6. That, with the view of more readily adopting the system of sewerage which I have advocated, it is expedient that sewage farms be obtained, upon which the sewage should be discharged by irrigation after passing through the necessary preliminary stage of extracting the solid matters from it.

7. That, with the view of effectually preventing the escape of noxious gases into the houses, it should be incumbent upon the owners or occupiers to provide air-pipes from the sewage pipes, carried above the level of the highest part of the houses, away from chimney-tops and attic windows."

——"The Hours of Labour" (Vickers, Strand) is the title of a paper read at the Century Club, under the auspices of the Labour Representation League (Mr. Brassey, M.P., in the chair), by J. George Eccarius. The object of the writer is to show that a general reduction of the hours of labour is necessary on social, economical, sanitary, and moral grounds, and is demanded by the working classes all over the world. The writer's

views are well and fairly stated, and the pamphlet deserves the attention of those who interest themselves in the question.——The *Nautical Magazine:* New Series. September, 1872. In this issue of the *Nautical Magazine* there is an account of Paget's revolving puddling-bar, with an illustration. The apparatus, which is interesting from its simplicity, is already in use in several British ironworks, though only introduced by Mr. Paget, the engineer, to the British ironmasters, about three or four months ago. The belt admits of its adapting itself with ease to the great variety of positions requisite; and the puddling-bar revolves 300 to 800 times per minute with white cast iron, and 800 to 1,000 for grey. Amongst the other papers is a brief one on Port Sanitary Authorities.—— The Prison Congress of London, July, 1872. Issued by the Howard Association for distribution at home and abroad. From this tractate we extract the "general conclusions of the Congress":—

"The general nature of the final recommendations of the Congress is thus summarised in the concluding report of the 'Executive Committee':—

'Recognising, as the fundamental fact, that the protection of society is the object for which penal codes exist, the committee believe that this protection is not only consistent with, but absolutely demands, the enunciation of the principle that the moral regeneration of the prisoner should be the *primary* aim of prison discipline.

A progressive classification of prisoners should be adopted in all prisons.

In the treatment of criminals all disciplinary punishments that inflict unnecessary pain or humiliation should be abolished.

To impel a prisoner to self-exertion should be the aim of systems of prison discipline, which can never be effective unless they succeed in gaining the will of the convict.

Work, *education*, and *religion* are the three great forces on which prison administrators should rely.'"

The gathering may be considered to have been on the whole successful, and will probably be followed up by another a few years hence.

Miscellanea.

The Ethics of "Tenders."—The *Globe* exposes a piece of sharp practice in connexion with "tenders for contracts," which, if true, is simply disgraceful. In one of the London parishes recently it was found necessary to contract for cleansing and watering the district. The number of firms in the metropolis capable of undertaking such a work is necessarily limited, and it is stated that their representatives, in consequence of the advertisement for tenders, met together, and decided among themselves which should accept the work best suited to his "plant," the others sending in tenders at such a rate that they must inevitably be refused. It was in effect, if the facts stated are correct, a combination to defeat the object of advertising for tenders altogether, and to control the market. It was further intimated that if the acceptance of a contract was not forthwith decided on, the contractors would withdraw their tenders, and, on some excuse or other, make a much higher estimate when further called upon. There was, consequently, in the face of this Sibylline proposal, but one course to adopt,—to accept the lowest tender, and to submit to the enforced monopoly.

Disinfecting Dwelling-rooms.—Some recent experiments prove the defectiveness of the ordinary process of disinfecting dwelling-rooms, after infectious and contagious diseases, without at the same time stripping off the paper and washing the walls and painted surfaces with caustic soda. In Manchester nearly all the men engaged in this duty have had fever or infectious disease, although the houses previously to their visits had been disinfected with chlorine, carbolic acid, &c. It is believed that contagious matter is retained in the paper, particularly when a number of layers have accumulated on the walls. In some cases the men removed as many as fifteen coats of paper; and they describe a fusty odour, which of itself may possibly give rise to fever. The recurrence of fever in the same houses in Manchester, it is said, has greatly diminished since the introduction of this thorough mode of cleansing.

New Infirmary for the Parish of Chelsea.— At a meeting of the board of guardians, held on Wednesday last, the resolution,—passed at a previous meeting,—postponing the commencement of the new building for a period of six months, was rescinded, and the tender of Messrs. Thorne & Co. accepted. The works are to proceed forthwith.

Fresh Works, Dover Harbour.—At the last meeting of the Dover Harbour Board, a decision was arrived at in reference to the improved scheme of Continental communication proposed to be effected by the adoption of the designs of Mr. Hawkshaw, whereby the harbour will be deepened so as to admit steamers of a draught of not less than the Holyhead class, and certain other improvements effected, including a covered way extending from each of the railway stations to the landing wharf, so that passengers may embark and disembark with perfect comfort, whatever the condition of the weather. The plan extends the harbour beyond the present entrance, and will cost in round figures some 200,000*l*. The improvements will include the covered way and station as above referred to, which will be used in common by both railways; the erection of a Custom-house, if necessary; and the provision of any other appliances requisite for the due accommodation of the public, and for averting the possibility of confusion and inconvenience which now sometimes arises.

Discovery of an Egyptian Papyrus 3,000 years old.—A papyrus has been found in a tomb, by Mr. Harris, editor of the *Hieroglyphical Standard*. As described, it forms a roll 134 ft. in length and 1 ft. 4½ in. wide. It dates from the end of the reign of Rameses III. (the Ramsinit of Herodotus), and contains valuable information relative to the political and religious civilisation of Egypt at that distant period. It is written in hieratic characters,—a mixture of hieroglyphics and signs for letters and syllables. The text is an allocution from Rameses III., "to his people and all the men on earth." Rameses therein recounts how he re-established the ancient Egyptian worship, rebuilt the temples, and endowed them with munificence. The religious movement alluded to relates to the period of Moses, to the monotheistic worship founded or restored by him, and comprises all the events which terminated in the ruin of monotheism in Egypt and the exodus of the Jews. This papyrus is, consequently, held to be of the highest interest for the study of the Mosaic religion and legislation.

Science and Art Instruction in the North of Scotland.—Classes for instruction in science and drawing are now very general in many parts of England and Ireland; but these classes have not met with much success in Scotland, except in a few large towns. The long-expected Education Bill for Scotland, and the naturally cautious habit of the people in adopting new subjects and ideas in education, have operated somewhat unfavourably. The Educational Institute of Scotland has held two or three meetings of teachers, at which the subject has been very fully discussed, and favourably received. In the northern counties most of the parish teachers are Masters of Art, and can receive payments for science-teaching without further examination. This will probably lead to the establishment of several classes during the coming winter. The papers also report public meetings at Aberdeen, Dundee, Banff, Cullen, Inverary, Irvine, Coatbridge, and other places, which have been addressed by Mr. Buckmaster, with very encouraging results.

Memorial of Sir John Simeon, Bart.—This memorial will shortly be commenced upon the selected site, at Newport, Isle of Wight. The proposed memorial consists of a cross about 10 ft. in height, placed upon a rectangular basis about 5 ft. high, which, in turn, rests upon a large mass of stone and a step. The whole height above the ground-level will be not less than 18 ft. The cross itself has a plain, solid stem and arms, at the junction of which it bears a large quatrefoil of incised work, containing the well-known monogram of our Saviour, "I.H.S." The base upon which this cross descends is the most ornamental portion of the structure, being on each side formed into a gable, covering a decorated niche filled with floral carving. Pinnacles complete each angle of the base. Below this recommences the plainer work, which forms the substructure. The memorial is to be executed in hard white stone, probably Portland, under the superintendence of Mr. Thomas Woolner, A.R.A., sculptor.

Chapel of St. Paul's, Stony Stratford.—We are asked to add to the account we gave of this building in our last, that it is warmed by means of pipes placed in trenches and covered with trellis, Messrs. J. L. Bacon & Co. executing the work.

Steam Power on Canals in America.—Although the offer of a prize of 100,000 dols. for the best mode of propelling canal boats by other means than horse-power appears to have stimulated invention, it looks very much as if it were likely to prove a failure, for the present at least, in eliciting any practical plan of propulsion that will meet all the required conditions. The commission appointed to test the inventions and make the award assembled in Albany a few days ago. The commission, after arguments by the various competitors, decided to modify the original rules, and adjourned to meet in Syracuse on the 1st of October. The final award will not be made until the close of the year. Several models have been prepared, of which one presented by Mr. Chase, of Portland, Maine, appears to have been the most novel and effective. It consists in the application of air, by means of a 15-horse-power engine and a rotary blower, under the stern of the boat, which is made in the shape of an inclined plane. The air is liberated by pipes against the stern, which is thus propelled in one direction, and the water in another.

Another Gas Explosion.—Another explosion, somewhat like that lately described, but of a more serious nature, has occurred in the residence of Mr. T. Eastlake, situate in the Temperley-road, Balham-hill. It seems that three persons were sitting in the dining-room on the ground-floor front, when the gas must have escaped from some parts of the chandelier, and *not being detected by any of the inmates*, had accumulated along the ceiling until it reached the burners, when the vapour became ignited, and an explosion of a loud and fearful character followed, prostrating and burning the three unfortunate occupants of the room, and at the same time blowing into the roadway the windows and igniting the furniture, &c. The wall of the drawing-room on the first floor was split and thrown out of its perpendicular, and eight other rooms in the building were also severely damaged by the force of the explosion. Fire-engines soon extinguished the fire, but the damage done is very considerable.

Twickenham Drainage.—The liability of the local authorities of Twickenham to pay a fine of 100*l*. a day for neglect in regard to drainage began on Friday, the time allowed by the Conservancy Board having expired on Thursday. At a special meeting of the Twickenham Local Board of Health, held the previous evening, Mr. Donnithorne, J.P., in the chair, the board having been informed by their legal adviser that the members themselves were personally liable to the penalty, the following resolution was carried unanimously:—"That the plans prepared by their surveyor for the drainage of the parish, including the river-side embankment, be adopted, subject to the approval of Mr. Lawson (the engineer who had been consulted by the board), and that such approval being obtained, the necessary steps be taken to obtain the requisite power to borrow the funds required."

Sewage Utilisation. — The Leeds Town Council Sewerage Committee have reported that they had carefully considered the process of the Native Guano Company, and that a contract had been entered into, after taking the opinion of Mr. Hawksley, for the first section of the necessary works, comprising a reservoir 618 ft. in length, with twelve compartments, enabling the sewage to flow at the rate of 12,000,000 gallons per day. The cost will be 14,950*l*., and the committee hope to have the whole in the contractor's hands in the course of a few weeks. The present works have been in full operation since October last, treating the sewage at the rate of 1,500,000 gallons per day of twenty-four hours, and the effluent water has been remarkably clear, it is said, and highly satisfactory to the committee.

The Air in Public and Private Buildings in Leicester.—Three instructive tables, with remarks by Mr. Richard Weaver, C.E., F.C.S., are given in the *Lancet*. The analyses given in the tables were undertaken during the past winter months, and test the condition of the air of manufactories representing the staple trades, and of places of public resort, schools, and private dwellings, in the busy town of Leicester; also the cubical space per individual, the number of persons present, and of gas-jets burning at the time of observation, with the internal and external temperatures, and the provision for the ventilation of rooms.

Statistics of Iron.—The total annual production of iron is estimated at about 11,125,000 tons for the whole world in 1869, and must have increased greatly in more recent years. At that time England produced over 5,000,000; the United States of North America over 1,500,000; France nearly 1,125,000; Prussia rather more than 1,000,000; Belgium not quite 500,000; the Austrian Empire a third of a million; Sweden and Norway nearly 400,000; Russia and the Zollverein nearly 500,000 tons between them, of which four-sevenths came from the former; Spain and Italy made up nearly 100,000 tons, two-fifths from the latter. The increase in the production of the United States in the five preceding years was nearly 64 per cent.; in Prussia, 36 per cent.; and in England, in six years, 26 per cent.—*Mechanics' Magazine.*

Wrought-iron Riband Columns. — The Riband Telegraph Post Company appear to be contributing their share towards the realisation of the principle in construction of a maximum of strength with a minimum of material. Their wrought-iron riband pillars are both economical and ornamental, and will no doubt come into use in other forms than that of telegraph-posts. For railway-stations, verandahs, conservatories, and shedding they seem to be well adapted. As to their relative strength, or the weight of roof they are capable of carrying, some particulars will be found in our advertisement columns. Compared with cast-iron pillars, the riband wrought-iron ones are said to be little more than one-third of the cost, as well as of the weight, while they are decidedly more ornamental.

The Liverpool School of Science.—The committee of this school have just issued the eleventh annual report, in which they say:—The number of students is much the same as in the previous session. Out of a rather smaller number of students, eighty-nine have passed the examinations in May, 1872, against 43 in the previous year, and of these the greatest proportional increase has been in the higher stages, namely, advanced and honours. The committee draw attention to the fact that three of the teachers were formerly pupils in the school, and two others have received instruction in similar institutions. The treasurer's report shows a considerable deficit this year, owing to the annual subscriptions falling far short of the required amount.

Proposed Improvements in Leeds.—There are several improvements contemplated by the Corporation of Leeds in their new Act of Parliament. Power has been taken to widen various streets. The powers of the Corporation for the compulsory purchase of lands for any of these improvements must be exercised within five years of the passing of the Act, and authority is given to borrow 100,000*l.* (in addition to the money borrowed under the Act of 1866) for the purposes of the improvements authorised by the new statute. It is to be hoped the Corporation will be well advised.

Farnham.—The work of building is proceeding extensively in this town, and considerable improvement is especially being manifested in South-street and the Borough. An Assembly-room, contiguous to the Royal Deer, has just been commenced, of which Mr. H. Harding is the architect; while the Wesleyan and Congregational chapels in the same road are progressing. The extension of Mr. Ransome's establishment, at the corner of South-street and the Borough, will effect an improvement in the appearance of that locality. Mr. Harding is also the architect of this work.

Yorkshire Archæological Society.—This Society had its annual trip this year to Ripon, where it was received by the mayor. Fountains Abbey was visited, and its details explained by Mr. Edmund Sharpe, M.A. Ripon Cathedral was afterwards inspected; descriptive remarks and a plan of each being given on the programme of the day's proceedings. A special first-class train ran to accommodate the members and friends, and thanks to the active exertions of Mr. Fairless Barber, the secretary, all passed off pleasantly and with success.

"Notes and Queries."—Sir Charles Dilke has become the proprietor of our useful and amusing contemporary, *Notes and Queries*, and has confided the editorship to the able hands of Dr. Doran, F.S.A. Mr. W. J. Thoms, its erudite and estimable founder, after conducting it for twenty-three years, had come to desire relief from the continuous work of editorship.

Harbour for Jersey.—The foundation-stone of a new harbour for Jersey has been laid. The works comprise a breakwater on the west, and a landing-pier on the east of the present harbour, to enable the mail packets to land passengers at all states of the tide. The estimated cost of the undertaking is 254,000*l.*, and it is to be carried out under the direction of Sir John Coode, who was engaged on the Portland Breakwater.

Fall of a Railway Viaduct near Plymouth. An accident has occurred upon the Cornwall Railway, near St. Germans, ten miles from Plymouth. The line crosses the river Notter by two long viaducts, one of which gave way. The accident, however, involved no consequences more serious than several hours' detention of trains.

American Patents.—The Patent Office has had a most extraordinary development within the past five years. Up to 1850 the patents but once reached 1,000 per annum. From that period until 1860 no year showed 5,000 patents; while the average of five years past has been over 13,000 per year.

The Local Board of West Ham District have determined to erect the necessary appliances for testing on a large scale General Scott's lime and cement process for treating sewage. Their resolution is based on the recommendation of their surveyor, Mr. Lewis Angell.

Cannon's Gas Regulating Cocks.—These cocks give the means of satisfactory control over the gas supplied to various floors of a building. They are made so shapely, too, that they need not be hidden away, but can be placed in positions where they may be easily seen.

West Ham Park.—A movement has been started in Stratford in favour of converting West Ham Park into a place of public recreation. It is stated that the land can be purchased for 20,000*l.* A committee has been formed to raise a fund for the purpose.

Technical Museum in Russia.—Russian journals have announced the opening at no distant time of a special technical museum for children. This museum is intended to teach the young the processes of manufacturing the various objects used in daily life.

Copper.—The *Financier* states that the price of copper was on Tuesday officially reduced as follows: — Manufactured, 110*l.* per ton; tile and tough copper, 103*l.* per ton. This shows a fall of as much as 8*l.* per ton as compared with the last officially fixed prices.

TENDERS

For the erection of warehouse on Dyers' Hall Wharf, London Bridge, for the Monument Warehouses Company. Wrought-iron joists to be supplied by the proprietors. Messrs. Eastman & Son, architects. Quantities by Messrs. Franklin & Andrews:—

Lucas, Brothers	£39,900 0 0
Higgs	39,228 0 0
Myers & Sons	39,200 0 0
Macey	38,584 0 0
Webster	37,610 0 0
Little	37,340 0 0
Colls & Sons	36,790 0 0
Coleman	36,550 0 0
Hill, Keddell, & Waldram	36,480 0 0
Axford	36,300 0 0
Rider & Sons	36,200 0 0
Browne & Robinson	35,879 0 0
Anscombe	35,240 0 0
Elkington	33,600 0 0
Crocket & Dickinson	30,490 0 0

For Trowbridge Drainage Works. Contract No. 1. Messrs. Gotto & Beesley and A. W. Estridge, engineers:—

Chappell	£15,000 0 0
Linzey	13,850 0 0
Wickham & Streeter	11,950 0 0
Coker	11,635 0 0
Neave	11,420 0 0
Potter	10,700 0 0
Long	10,400 0 0
Bugbird (accepted)	10,036 11 0
Stevens & Crook	8,624 0 0

For Baptist Chapel and Schools at Melton Mowbray, Leicestershire. Mr. F. T. Mercer, architect. Quantities supplied:—

Hobson & Taylor	£1,847 0 0
Dean	1,843 0 0
Barnes	1,689 0 0
Chapman & Waite	1,645 0 0
Hayes	1,613 4 11
Clarke	1,433 9 3

For repairs, alterations, and additions, at No. 11, Berkeley-street, Portman-square, for Mr. James Moore. Mr. William Ward, architect:—

Garrod & Smith	£585 0 0
Slade	579 0 0
Brown	569 0 0
West	538 0 0
French (accepted)	495 0 0

Accepted for new Independent school, East Moor, Wakefield (exclusive of fittings and painting). Mr. A. Hamerton, architect:—

Brick and Stone Work.

Elvey	£236 10 9

Slating.

Ryeroft	21 10 6

Wood Work.

Squires	95 10 0

Plumbing and Glazing.

Kirk	18 0 0

Plastering.

Tattersall	19 16 0

For the erection of a new chimney-shaft and boiler setting at the brewery, Earl-street, Maidstone, for Messrs. Fremlin, Brothers. Mr. George Scarnell, architect. Quantities supplied by Messrs. Curtis & Son:—

Moreland & Son	£1,020 0 0
Bridge	1,010 0 0
Vaughan	890 0 0
Anscomb	888 0 0
Wallis (accepted)	879 10 0

For alterations and repairs to No. 8, New Cavendish-street, Portland-place, for Mr. S. B. Clark. Messrs. Goulty & Gibbins, architects. Quantities supplied by Mr. J. C. Lansdown:—

Colls & Son	£960 0 0
Scrivener & White	908 0 0
Stephens	889 0 0
Watson, Brothers	856 0 0
Brown	780 0 0

For addition to infants' school, Roehampton. Mr. J. Chambers, architect. Quantities not supplied:—

Dawson	£805 0 0
Gibbs	763 0 0
Nye	729 0 0
Grover	718 0 0
Aries (accepted)	700 0 0

For main brick sewers "Sale Sewerage Works, Contracts 12 and 13," for the Sale Local Board. Mr. A. G. McBeath, engineer:—

	Contract 12.	Contract 13.
Hamnett (accepted)	£1,360 0 0 ...	£1,030 0 0

For schools and master's house at Linslade. Mr. J. T. Lawrence, architect. Quantities supplied by Messrs. Paice, Brothers:—

Mead & Hammerton	£2,317 0 0
Waterson & Co.	1,795 0 0
Edwards	1,764 0 0
Smith & Fincher	1,712 0 0
Snell	1,700 0 0
Alen	1,600 0 0

For alteration and addition to No. 139, High-street, Croydon, for Mr. J. Pelton. Mr. R. W. Price, architect:—

Hipwell	£730 0 0
Walker	697 0 0
Jarrett	676 0 0
Smith	627 0 0
Legg	595 0 0
Peskett & Taylor (accepted)	589 0 0

For erecting new infirmary for the parish of Chelsea. Messrs. John Giles & Gough, architects. Quantities supplied by Mr. C. H. Goode:—

Neave	£19,882 0 0
Heath	19,351 0 0
Fish	18,985 0 0
Stephenson	18,459 0 0
Elliott	17,997 0 0
Lathey, Brothers	17,955 0 0
Gough	17,000 0 0
Sawyer	16,885 0 0
Manley & Rogers	16,797 0 0
Rankin	16,135 0 0
Thorne & Co. (accepted)	15,750 0 0
Turrell, Brothers	15,587 0 0

For repairs and alterations at 10, Queen's-gardens, Hyde-park, "Verrall" should be *Verzoli*.

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M. F. (there is nothing to prevent any one from writing C.E. after his name if he so desire).—J. A. B. (would require an essay to answer him).—H. H. V. (please send plan).—A. O. (we cannot look back).—B. & Co. (we cannot state what we are not informed of).—Mrs. C. H. S.—L. T.—A. H.—J. H. L.—H. & B.—B. F.—J. N.—J. A. R.—R. G.—Voice from the North.—W. P.—A. McB.—G. W. A.—S. V.—C. W. K.—P. B.—P. & T.

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219,704	Messrs. Hunt & Roskell, New Bond-street, W.	52 10 0
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T. SOMERVILLE JONES, Clerk to the said Board.
Public Offices, Egremont, 29th August, 1872.

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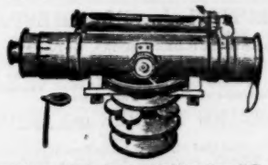

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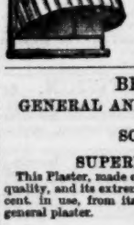
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